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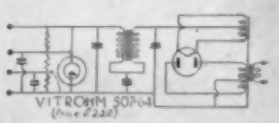

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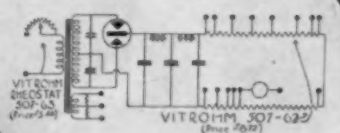

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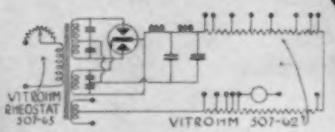

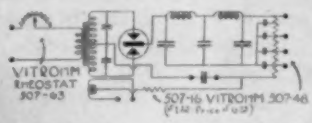

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QST

The Official Organ of the A·R·R·L

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The American Radio Relay League

The American Radio Relay League, Inc., is a non-commercial association of radio amateurs, bonded for the promotion of interest in amateur radio communication and experimentation, for the relaying of messages by radio, for the advancement of the radio art and of the public welfare, for the representation of the radio amateur in legislative matters, and for the maintenance of fraternalism and a high standard of conduct.

It is an incorporated association without capital stock, chartered under the laws of Connecticut. Its affairs are governed by a Board of Directors, elected every two years by the general membership. The officers are elected or appointed by the Directors. The League is non-commercial and no one commercially engaged in the manufacture, sale or rental of radio apparatus is eligible to membership on its board.

"Of, by and for the amateur", it numbers within its ranks practically every worth-while amateur in the world and has a history of glorious achievement as the standard-bearer in amateur affairs.

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EDITORIALS

ALL of us believe that the accomplishments of a skilled radio amateur are such that he has made a valuable citizen out of himself for his country. A recent letter from Canuck 3GG presents several new slants on this idea, which we think so interesting that we are presenting them on this page.

Amateur radio is unique among hobbies. In its pursuit the radio amateur possesses himself of a knowledge that increases his value to his nation, he trains himself to defend it, and, in order to accomplish these things, he buys all his own equipment! A novel idea for armies, isn't it?

He has perfected a wonderful communication system that is available for public service in time of community peril or national emergency. While nearly every other hobby under the sun is pursued merely for the pleasure it brings, the radio amateur competes with his fellows during emergencies for the honor of working intensely for long watches without rest, often at great discomfort, and for no compensation other than the joy of service and the sense of satisfaction in a hard job well done.

Governments possess in their radio amateurs a self-supported reserve of trained specialists, capable of rapid mobilization, kept in constant training, drawing no pay yet buying all their own equipment with which to train! What other hobby can boast as much value to the government in time of war? To get a better viewpoint of what this really means to the United States one must ask himself of what use twenty-thousand golfers, pinochle players, stamp collectors or pool players would be to the nation some nice fine morning when the sky goes black with enemy aircraft. Ask the Army—they know!

The untiring efforts, perseverence and dogged persistence of the radio amateur have laid the foundations for one of the largest industries in the world—the radio industry—and the chief exhibit of the amateur from that effort is the scars of numerous battles in which he had to engage to insure his existence. Consider the unique position of radio among industries. Thousands of skilled experimenters who buy all their own tools from this industry and receive no wages, are engaged in work which will inevitably be of incalculable value to the very industry which sold them the tools with which to work! Is there a parallel to be found?

Finally, it seems very likely that radio amateurs have done more for world peace and understanding than all the other hobbyists and all the lobbyists that ever existed. In the dismal certainty that war is not ended we must continue to think of armies and of preparedness against unjust aggression, but that cannot lessen anyone's appreciation of the intense value of fostering international good will and understanding by the contact between large bodies of private citizens of different countries. That contact is made possible by the present status of international amateur radio. What a splendid thing it is to have a considerable number of the young men of every country, the leaders of to-morrow, on the air each night learning to know their fellows in every civilized land in the world! Wars there may be but the young man of to-morrow is going to be able to know a just war from a politically-determined one, and no Stuffed Shirt or Brass Hat of the future is going to be able to stampede the youth of his land into an unjust conflict with the youth of another land—not when those young men know and understand each other, as amateur radio is to-day teaching them!

And now doesn't it just appear that the radio amateur is worthy of all the operating privileges that his government can give him? Isn't it clearly the duty of every enlightened government—or, if you please, isn't it clearly to its selfish interest—to see that adequate privileges are given its radio amateurs, in order that these benefits may redound to the State?

K. B. W.

Short-Wave Radio Transmission and Its Practical Uses

Part 1*

By Chester W. Rice**

THE EARTH'S atmosphere is composed of two concentric spherical shells. The inner one is called the Troposphere and is distinguished by the fact that the temperature decreases as we go upwards; the rate of fall being in the neighborhood of 17.° F. per mile (6° C./km.). In this region there is a continual churning motion which keeps the different constituents of the air thoroughly mixed and therefore of constant proportions.

The outer shell is called the Stratosphere and is distinguished by the absence of a temperature gradient and consequently, any large-scale mass motion. It is sometimes referred to as the isothermal layer. The boundary between the two layers is of course not sharp, and the thickness of the transition layer, in which the mass motion practically dies out, is not precisely known.

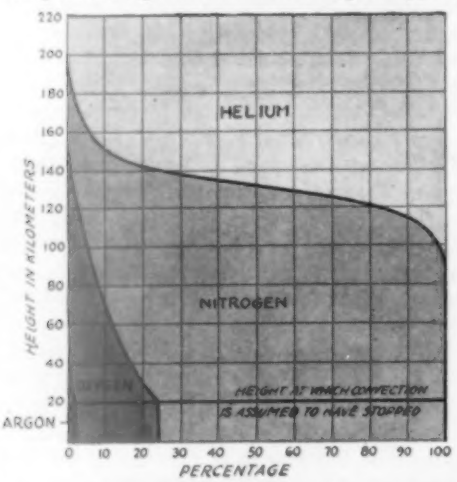

FIG. 1. TO UNDERSTAND RADIO TRANSMISSION THRU THE AIR ONE MUST FIRST KNOW SOMETHING OF THE AIR

This drawing shows how the composition of the air changes with height and how it is therefore possible for radio waves to act differently at different heights.

We may assume, however, that mass motion ceases at a height of about 12½ miles (20 km.). Above this the temperature remains practically constant at 65.3° Fahrenheit below zero (-54° C.).

At the surface of the earth the air is composed of Nitrogen, Oxygen and Argon, with traces of Carbon-Dioxide, Krypton, Xenon, Neon and Helium. This composition remains the same throughout the lower layer, that is, up to about 12½ miles. In the outer layer the mixing ceases and therefore a sort of "setting-out" effect causes the heavier constituents to predominate in the lower levels, leaving the atmosphere composed of the light gas, *Helium* at great heights.

This state of affairs is represented graphically in Fig. 1 which is taken from a paper by Chapman and Milne.[2]

At the surface of the earth we start with about 76% Nitrogen, 23% Oxygen and 1% Argon. This composition remains constant up to about 12½ miles (20 km.). At 50 miles (80 km.) the proportion of Nitrogen has increased to 92% and the Oxygen dropped to 8%, the Argon having practically disappeared. Here, Helium is just beginning to reach an appreciable proportion. At 83 miles (133 km.) we find half Nitrogen and half Helium, and at 125 miles (200 km.) the atmosphere is practically all Helium.

AIR PRESSURES

It is now interesting to see what pressures we have at different heights, above the earth. At 12½ miles, (20 km.) which is the top of the inner layer, we find that the pressure is about 1/20 of that at the surface of the earth. In the vicinity of 50 miles (80 km.) it has dropped to approximately 1/160,000th of that at the surface. This pressure is what we would ordinarily call a fair vacuum. At 125 miles (200 km.) the pressure is approximately 1/180,000,000th of an atmosphere which is probably lower than the best vacuum usually obtained in the laboratory. When we reach 1000 to 2000 miles, which we may call the outermost limit of our atmosphere, the pressure has fallen so low that the Helium atoms will travel in elliptic orbits around the earth forming a series of infinitesimal satellites. A few atoms which happen to have acquired very high velocities will describe hyperbolic orbits and be lost to the earth's atmosphere forever.

Table I gives some of the above facts in greater detail. Here the pressure, number of molecules, approximate molecular mean free path and average collision frequency between an electron and gas molecule are given for different heights.

*The second and last part will appear in the next number of *QST*.

**Research Laboratory, General Electric Co. Schenectady, New York.

2. Quarterly Jour. of the Roy Meteorological Soc. Vol. 46, p. 357, 1920.

IONIZATION IN THE UPPER ATMOSPHERE

The theories of the amorae (diurnal variations in the earth's magnetic field) as well as the familiar magnetic storms which sometimes interrupt telegraph service, are based upon the existence of ionization in the upper atmosphere.

In the early days of radio, Kennelly[3] and independently Heaviside[4], suggested the need of an ionization layer to account for the observed long distance radio transmissions. More recently Watson[5] has shown that an equation of the Austin-Cohen type, which is known to represent long-wave experience, can be obtained theoretically if a conducting upper atmosphere is assumed.

HOW THE AIR IS IONIZED

The present views appear to favor the hypothesis that the ionization in the upper atmosphere is maintained partly by the "penetrating radiation of cosmic origin'" which has attracted so much recent discussion and partly by the action of high velocity electron streams which reach the earth's atmosphere from the sun.

Milliken's recent results indicate that the penetrating radiation comes at a constant rate, day and night, and fairly equally from all directions of space.

When the high velocity electron streams approach the earth, the earth's magnetic field will concentrate them at the poles and bend them around the earth into the dark hemisphere. On this view the maximum ionization intensity will be expected in the polar regions where the electrons are concentrated by the effect of the earth's magnetic field and on the sunlit hemisphere where they are received by direct impact. Figures 2 and 3 show some of the electron paths as calculated by Störmer[7].

The tendency of an electron stream to become spread out in space during its long trip from the sun, because of the mutual repulsion of like charges will be partly compensated by the magnetic attraction due to their high velocity. In the limiting case of light velocity, the mutual electrostatic repulsion will be balanced by the mutual magnetic attraction.

Rayleigh[8] has shown that the green auroral line, which McLennen[9] proved to be due to Oxygen, is always present in the night sky and in this way confirmed the existence of strong ionization on the dark side of the earth.

Chapman and Milne[2] have calculated on certain assumptions the distribution of ionization which would result from the absorption of various types of radiation in the earth's atmosphere. Their calculations show that the ionization should start with a small value near the earth and increase with the height reaching a maximum value somewhere in the upper atmosphere and will then decrease again to a small value at very great heights. A distribution of this sort is shown in Fig. 4 where the height, thickness and maximum ionization values are those required on the present theory of radio transmission to account for the relatively meagre experimental data. This procedure is made necessary since at the present time short wave radio experiments appear to be the most direct method we have of estimating the ionization conditions existing in the inaccessible regions of the outer atmosphere. Sounding balloon experiments have given information concerning the lower atmosphere and possibly someday an ionization gauge in a high velocity shell will give direct evidence about the upper atmosphere.

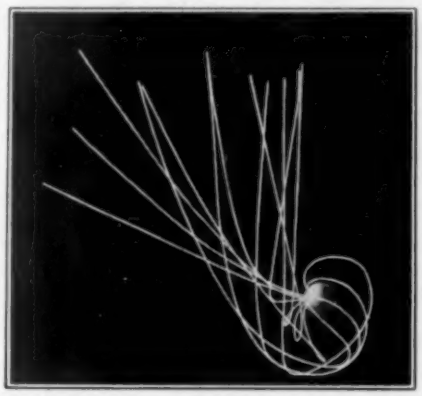

FIG. 2 HOW ELECTRONS COMING FROM THE SUN TO THE EARTH TWIST ABOUT WHEN THEY MEET THE EARTH'S MAGNETIC FIELD

WHY THERE IS IONIZATION AT NIGHT

In the daytime the electrons arrive directly from the sun and therefore penetrate deep into the atmosphere before being brought to rest by collisions with the gas molecules. At night the electrons have to be bent around the earth by the magnetic field. In so doing, more air is traversed and therefore they will not get so close to the earth before being stopped. Superimposed upon this variable effect, we have the prac-

3. A. E. Kennelly: Elect. World and Engineer, March 15, 1902.
4. Oliver Heaviside: Encyclopedia Britannica, tenth edition, Vol. 33, Dec. 1902.
5. G. N. Watson: Proc. Roy. Soc. Lond., Vol. 95, pp. 562, 1919.
6. The subject has been extensively investigated during the past fifteen years principally by Hess, Kolhorster, and more recently, Milliken. An excellent review with copious references is given by Birge, Jour. Opt. Soc. of Am., Vol. 14 up pp. 112, 1927.
7. Stormer, Terr. Mag. and Atmos. Elect., March 1917, pp. 22.
8. Lord Rayleigh, Proc. Roy. Soc. Lond., Vol. 109, pp. 428, 1925.
9. McLennan, McLeod and McQuarrie, Proc. Roy. Soc., Vol. 114, pp. 1, 1927.

tically constant ionization distribution due to the penetrating radiation of cosmic origin.

The day value is relatively well fixed by the radio experiments, and it is interesting to note that it is located in the vicinity of

HEIGHT IN KILOMETERS	PRESSURE DYNES PER SQ. CM	NUMBER OF MOLECULES PER C.C	MOLECULAR M.F.P. CM	ELECTRON COLLISION FREQUENCY PER SEC
0	1.01×10^{6}	2.7×10^{19}	$9.\times10^{-6}$	9.5×10^{11}
12	1.92×10^{5}	6.5×10^{18}	$4.\times10^{-5}$	2.1×10^{11}
20	5.53×10^{4}	1.9×10^{18}	$1.\times10^{-4}$	8.5×10^{10}
40	2.55×10^{3}	8.6×10^{16}	$3.\times10^{-3}$	2.8×10^{9}
60	1.24×10^{2}	4.2×10^{15}	$6.\times10^{-2}$	1.4×10^{8}
80	6.27	2.1×10^{14}	1.0	8.5×10^{6}
100	.363	1.2×10^{13}	20.	4.3×10^{5}
150	1.49×10^{-2}	5.0×10^{11}	500.	1.7×10^{4}
200	5.62×10^{-3}	1.8×10^{11}	1000.	8.5×10^{3}
300	6.99×10^{-4}	2.4×10^{10}	1×10^{4}	8.5×10^{2}
400	1.05×10^{-4}	3.6×10^{9}	7×10^{4}	1.2×10^{2}
600	2.59×10^{-6}	8.8×10^{7}	3×10^{6}	2.8
800	7.97×10^{-8}	2.7×10^{6}	9×10^{7}	.95
1000	2.92×10^{-9}	9.9×10^{4}	3×10^{9}	2.8×10^{-3}

TABLE I. THE REALLY IMPORTANT THING ABOUT THE CHANGING PRESSURE AND COMPOSITION OF THE AIR AS ONE GOES UP IS THE EFFECT OF THESE CHANGES ON THE LENGTH OF THE MEAN FREE PATH (M.F.P.) WHICH IT IS POSSIBLE FOR AN ELECTRON TO TRAVEL THRU BEFORE COLLIDING WITH SOMETHING WHICH WILL DEFLECT OR STOP IT

the observed auroral height measurements. The night values may appear rather high and perhaps further experiments will show that they should be brought lower down.

RADIO EXPERIMENTS

Let us now review the available radio propagation data and see how the assumption of an ionization gradient in the upper atmosphere allows us to account for the apparently anomalous behavior of short waves. The meagre experimental "skip distance" data which have been used in the following calculations are now two years old and, therefore, probably require revision. The effect of a revision would be to alter the location and maximum ionization values in the upper atmosphere, and the numerical value of the "short wave limit", etc., but should not affect the general conclusion to which the theory leads.

In Fig. 5 we have attempted to summarize the available data on medium and short wave propagation tests. Most of the data are from the valuable papers by Taylor[10] and Taylor and Hulburt[11] with a few check points kindly supplied by Young[12]. We have also obtained considerable help in drawing the smooth curves through the few scattered points from the valuable work published by many amateurs[13]. The large absorption shown in the figure in the vicinity of 214 meters is undoubtedly due to the resonance effect produced on the free electrons by the earth's magnetic field which calculation shows should occur at the frequency which corresponds to this wavelength. This, and other interesting magneto-optic effects, such as rotation of the plane of polarization, double refraction, etc., were recently independently suggested by Appleton[14] in England, and by Nichols and Schelleng[15] in this country. The present discussion will be confined to the propagation phenomena on the short wave side of 214 meters where the effective electron restoring force due to the earth's magnetic field will cease to be important compared with the electron inertia and may, therefore, be neglected as a first approximation.

In recent years, propagation tests on short waves (i.e. below 60 meters) have definitely brought to light many peculiarities which were entirely unexpected from our many years of long-wave experience.

As a typical example of the peculiarities of short-wave transmission, let us describe the results obtained with a 5-Kw. 20-meter transmitter. At this wavelength the signal rapidly decreases as we leave the transmitter, due to spreading and energy absorption by the ground, and reaches the lower useful limit of 10 microvolts per meter at

FIG. 3. MORE EXAMPLES OF THE WAY IN WHICH HIGH-SPEED ELECTRONS COMING TO THE EARTH MAY BE CAUSED TO CURVE WHEN ENTERING THE EARTH'S FIELD. THIS AND FIG. 2 ARE FROM CALCULATIONS BY STORMER

about 60 miles. This short range is what might be called the expected value as viewed from our long-wave experience and is rep-

10. A. Hoyt Taylor, Inst. Radio Eng., Vol. 13, pp. 677, 1925.
11. A. Hoyt Taylor and E. O. Hulbert, *QST* Oct. 1925, pp. 12. Also, Phy. Rev., Vol. 27, p. 189, 1926.
12. C. J. Young, Unpublished reports on Short Wave Transmission Tests by the General Electric Co. at Schenectady, N. Y.
13. See for example *QST*, 1924 and 1925.
14. E. V. Appleton, Proc. Phy. Soc. Lond., Vol. 37, Part 2, pp.16D, 1925.
15. W. H. Nichols and J. C. Schelleng, The Bell System Tech. Jour., Vol. IV, pp. 215, 1925.

resented in Fig. 5 by passing to the right of the line marked "Limit of Ground Wave." If we now continue to greater distances the signal remains out until we reach approximately 850 miles where the day signal unexpectedly becomes strong again. This is represented in the figure by crossing to the

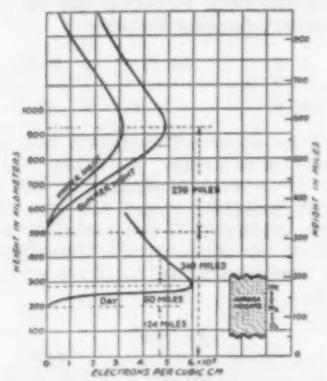

FIG. 4. THE DISTRIBUTION OF IONIZATION IN THE UPPER AIR, AS CALCULATED FROM RADIO TRANSMISSION EXPERIMENTS

Note how much the aurora may carry the ionized layer down.

right of the curve marked "Minimum Range of Sky Wave by Day." Continuing to greater distances we find the signal gradually falling off in intensity and reaching the useful limit of 10 microvolts per meter in the vicinity of 4000 miles by day. This is represented in Fig. 5 by passing to the right of the curve marked "Maximum Day Range." On a summer night the signal does not reappear after the 60-mile extinction until we are approximately 4000 miles from the transmitter, after which the signal falls off gradually to a very low value at 6500 miles.

The unexpected reappearance of the signal beyond 50 miles which we may call the "ground wave" limit, is accounted for by a bending back to earth of a portion of the energy which is radiated towards the sky. This bending or refraction is attributed to the presence of the free electrons in the ionized portion of the upper atmosphere.

A reflection theory of this effect has been proposed by Reinartz[16].

More recently a refraction theory has been developed by Taylor and Hulburt[17]. Eccles[17] appears to have been the first to apply the electron theory of optical dispersion, which was developed by Lorentz[18] and Drude[19], etc., to the problems of radio wave propagation. The present investigation was inspired by the work of Lamor[20].

HOW WAVES MAY BE BENT

When an electromagnetic wave passes through an electron atmosphere it sets the electrons in motion, with the result that the effective or phase velocity of the wave is increased above that in free space.

Let the electric field intensity of the wave be

$$E = E_m \sin \omega t \qquad (1)$$

The force exerted on an electron carrying a charge e is e E and since for a free electron no elastic restoring or dissipative forces exist, the total applied force is consumed in accelerating the electron mass m, giving

$$m \frac{dv}{dt} = e E_m \sin \omega t \qquad (2)$$

Integrating equation (2) and putting the constant of integration equal to zero, since

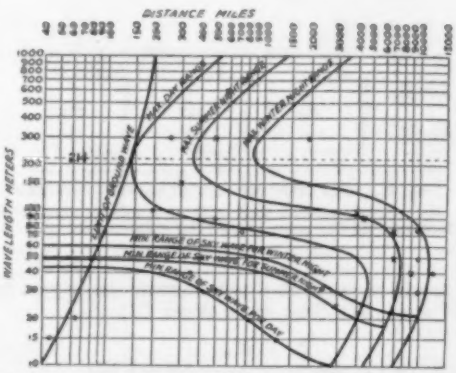

FIG. 5. APPROXIMATE AVERAGE TRANSMISSION PERFORMANCE OF DIFFERENT WAVELENGTHS AT DIFFERENT DISTANCES

It is assumed that the received signal must have commercial strength, which calls for a field-strength of 10 microvolts per meter at the receiving point. The transmitter is assumed to have 5000 watts in the antenna. The chart is rather confusing but may be explained as follows. To the left of the line marked "limit of ground wave" it should be possible to receive at all times. After that, one must pick a pair of curves of the same sort (that is for the same time) and if the distance is between the curves one should hear the signal. Thus, a 30-meter wave should be reliable at all times to 70 miles for the conditions mentioned. From there to 400 miles its daylight performance will probably be uncertain while from 400 on it will gradually die down until at 4600 it will again be below 10 microvolts per meter. There are, of course, numerous exceptions where one does not hear the predicted signal and others where one does hear it when it should be absent. The curves are mainly from data by A. H. Taylor.

16. John L. Reinartz, *QST*, pp. 9, April, 1925. (In connection with this article there was suggested by F. C. Beekley and myself a refractive bending of the wave in the manner shown in Fig. 7 and 8 of this article and covering the phenomena shown there except the limiting ray path. This appeared as a note signed "Tech. Ed."—R. S. K.

17. W. H. Eccles, Proc. Roy. Soc. Lond., Vol. 87, p. 79, 1912.

18. H. A. Lorentz, The Theory of Electrons, Teubner, 1909.

19. Paul Drude, The Theory of Optics (Engl. Trans. by Mann and Millikan), Longmans, 1917.

20. Joseph Larmor, Phil. Mag., Vol. 48, p. 1025, 1925.

we are not concerned with the *random* velocities, we obtain

$$V = -\frac{e}{m}\frac{E_m}{\omega}\cos \omega' t \quad (3)$$

where v=electron velocity due to electric field.

If there are N of these electrons per cu. cm. moving with the velocity v they will con-

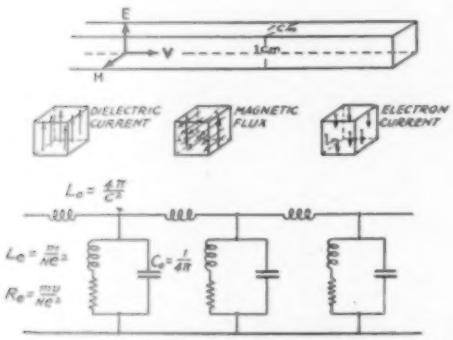

FIG. 6. THE AIR AS AN ELECTRIC FILTER
An electric circuit that will give effects similar to those put on the wave in passing thru ionized air.

stitute a current i_1 per square cm. equal to N e v. We thus have from (3)

$$i_1 = -\frac{N e^2}{m}\frac{E_m}{\omega}\cos \omega t \quad (4)$$

In addition to this electron current we have the ordinary condenser charging current flowing across the unit cube. The electric intensity or potential gradient in the wave is E and, therefore, the potential difference between two planes one cm. apart is E times one cm. The capacity of our imaginary condenser which has two plates of one sq. cm. area and one cm. apart is $C=\frac{1}{4\pi}$ since the dielectric constant is unity. The charging current for this unit condenser is

$$i_2 = \frac{1}{4\pi}\frac{d E}{d t} \quad (5)$$

Differentiating equation (1) with respect to t we have

$$\frac{d E}{d t} = \omega E_m \cos \omega t \quad (6)$$

Substituting this relation in (5) we obtain for the charging current density

$$i_2 = \frac{1}{4\pi}\omega E_m \cos \omega t \quad (7)$$

The total current i, is obviously the sum of the two currents i_1 and i_2.

$$i = \frac{1}{4\pi}\left\{1 - \frac{4\pi N e^2}{m \omega^2}\right\}\omega E_m \cos \omega t \quad (8)$$

By substituting equation (6) in (8) the total current density becomes

$$i = \frac{1}{4\pi}\left\{1 - \frac{4\pi N e^2}{m \omega^2}\right\}\frac{d E}{d t} \quad (9)$$

It will be observed that *this becomes the ordinary expression for the charging current of a unit condenser* if we let the bracketed quantity stand for the effective dielectric constant of the material between the plates. In other words, the effective dielectric constant of an electron atmosphere becomes

$$k = 1 - \frac{4\pi N e^2}{m \omega^2} \quad (10)$$

The quantities in the above expression are all in c.g.s. electrostatic units.

N = number of electrons per cu. cm.
e = electron charge $= 4.77 \times 10^{-10}$ e.s.u.
m = 8.97×10^{-28} grams
$\omega = 2\pi f$
f = frequency in cycles per second
$4\pi e^2/m = 3.2 \times 10^9$ c.g.s. (e.s.u.)

We see from equation (10) that the effect of electrons in reducing the apparent dielectric constant of space is, for a given fre-

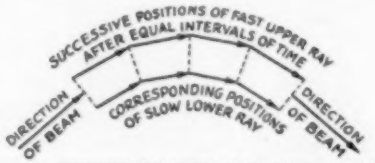

FIG. 7. A SKETCH OF THE MANNER IN WHICH A WAVE IS BENT

quency, proportional to the total number N present per cu. cm., and to the square of their charge and is therefore independent of the sign of the charges, and is inversely proportional to their mass. The lightest gas ion is that of Hydrogen having a mass of approximately 1800 times that of an electron. It is, therefore, evident that for anything like equal numbers the effect of gas ions on the effective dielectric constant can be neglected.

The velocity of an electromagnetic wave in a medium is inversely proportional to the square root of the permeability times the dielectric constant of the medium. For our

case the permeability is unity and the effective dielectric constant that given by equation (10). We may, therefore, write for the velocity

$$c' = \frac{c}{\sqrt{K}} \text{ cm. per sec.} \quad (11)$$

where $c = 3 \times 10^{10}$ cm. per sec. velocity of light.

The refractive index of a medium is defined as the ratio of the velocity of light in a vacuum to that in the medium.

$$\mu = c/c' \quad (12)$$

From (10), (11) and (12) we obtain

$$\mu = \sqrt{1 - \frac{4\pi N e^2}{m \omega^2}} \quad (13)$$

as the refractive index of our electron atmosphere. The second term under the radical is always positive, and therefore the effect of the electrons is always to reduce the refractive index below unity. This means that the apparent velocity of the radio wave will be increased above that in free space when it enters an ionized medium.

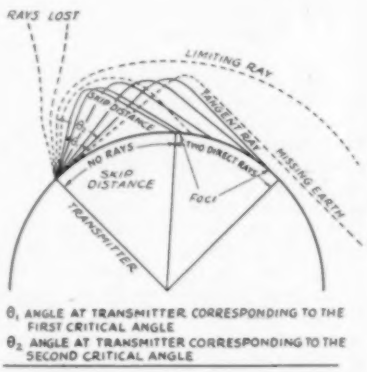

FIG. 8. DIAGRAM SHOWING THE VARIOUS POSSIBLE PATHS OF RADIATION

The vertical and near-vertical rays penetrate the ionized layer and wander away. When one reaches the "limiting angle" the ray just does get bent enough to be kept from wandering away, but it continues to graze the layer and is after all worthless. Below this angle we have progressive reflection (or refraction) and the ray returns to earth. As the angle of departure from the transmitter is chosen flatter and flatter the energy strikes so far away as to miss the earth, possibly going out to the ionized layer again, and perhaps even being reflected down a second time if it has energy enough left.

A comparison of the signs of equations (4) and (7) shows that the electron current is opposite in phase to the condenser charging current. In other words, the inertia due to the to-and-fro motion of the electrons is equivalent to shunting the capacity of each unit cube of space by an inductance equal to $m/N\ e^2$.

THE ATMOSPHERE AS AN ELECTRICAL FILTER

Another way of looking at the problem is to draw the equivalent circuit for the propagation of a wave in an electron atmosphere. This has been done in Fig. 6.

Here $L_o = 4\pi/C^2$ represents the series distributed inductance of space per unit length and unit cross section. $C_o = 1/4\pi$ is the distributed shunt capacity of space and $Le = m/Ne^2$ is the equivalent shunt inductance due to the loading effect of the free electrons. The effect of electron collisions with molecules may be represented by the resistance $Re = m\mu/Ne^2$ where μ is the collision frequency between an electron and molecule.

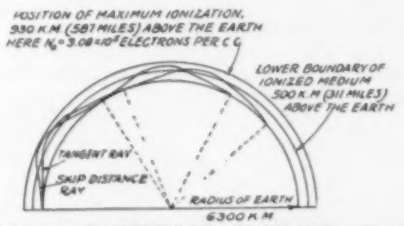

FIG. 9. A PARTICULAR EXAMPLE OF THE GENERAL EFFECT THAT WAS SHOWN IN FIG. 8

This diagram shows the calculated ray paths for a 25-meter transmitter on a winter night.

The effect of the electron shunt inductance is to tune out some of the natural capacity of space and therefore raise the apparent velocity of propagation above that of light.

If we now imagine two adjacent rays, Fig. 7, in which the upper ray has a higher velocity than the lower ray, because the upper ray is travelling in a denser electron atmosphere, we see that the front of the upper wave will run ahead of the front of the lower wave and therefore the wave front will bend downward and the beam which started out towards the sky will return to earth at some distant point.

Following out this idea we find that a ray starting out at a low angle will be only slightly bent or refracted and come to earth again at a great distance from the transmitter. For higher angles the rays will return to earth progressively nearer the transmitter. Finally, a critical angle is reached for which the refracted ray comes down at the nearest distance to the transmitter. For higher angles the points of return recede from the transmitter until eventually a second critical angle is reached at which the ray does not return to earth, but instead goes out into space and is lost. This effect is shown diagrammatically in Fig. 8.

"SKIP DISTANCE"

The distance from the transmitter to the nearest point at which the refracted sky

wave returns to earth has been called the "skip distance." For a given wavelength the skip distance is a minimum in the middle of the day and a maximum on a winter night. This follows from the fact that by day we have strong ionization due to the direct impact of the electrons from the sun, while at night the ionization is less.

Experiments show that the skip distances for a given time of day or night *decrease* with *increasing* wavelength. This observation is in agreement with the increase in refraction on the longer wavelengths. Calculations show that a concentration of energy or what may be called a "focussing effect" occurs just beyond the skip distance and again inside of the point where the ray leaving the transmitter tangent to the ground, comes back to earth. This effect is illustrated in Fig. 8.

We may expect severe fading right at the skip distance since here too sky waves having traversed different paths are concentrated at the same point, and consequently, interference effects are likely to occur. A little beyond the skip distance the ray of higher initial angle rapidly dies out leaving one ray only and consequently a better chance for a steady signal.

From the above considerations it follows that when we are selecting a wavelength to cover a given distance we should try to have the receiver just beyond the skip distance or just inside of the tangent ray focus. (It is, however, not correct to assume that one can always prophecy exactly where a signal will be heard and where it will not be heard. There is a distinct tendency to regard these transmission rules as absolute. The distances are decidedly anything but absolute.—Tech. Ed.)

Obviously, a portion of the incident energy which strikes the ground will be reflected towards the sky and return to earth again at twice the initial distance from the transmitter as shown in the calculated paths of Fig. 9. Thus, if conditions are unfavorable to locating the receiver just beyond the skip distance or just inside the tangent ray focus, our next choice is to place the receiver at a multiple of one of these distances so as to receive the reflected energy from one of the two foci.

(Editor's Note:—The second part of this paper which will appear in August, will discuss the practical application of the theory to amateur practice.)

The Michigan State Central Division Convention

WHILE the attendance at this the Sixth Annual Michigan Convention, held at the Hotel Tuller, Detroit, on May 20 and 21, was not as large as last year, Ralph Thetreau and his committee did everything possible to make the delegates satisfied that their trip was not in vain.

Dr. E. C. Woodruff, professor of electrical engineering, State College, Penna., and Director of the Atlantic Division, is getting to be a regular convention "hound", and is more interesting every time we hear him. His talk on small portable sets, Milliammeter Stunts and Tube Voltmeters showed that he understands his radio. Director Darr gave a lot of information on Crystal Control, based on practical experience. C. G. Williamson, 8BRV, spoke on Mercury Arc Rectifiers and certainly has had considerable practical experience and his talk was instructive. Fieldman Hebert explained "skip" distance phenomenon of 20 and 40 meters and Dr. Van Becclaere, 8WO, gave valuable information on the operation of Master-Oscillator Power-Amplifier Sets.

The traffic meeting in charge of "Tate" gave the gang their first opportunity to hear Assistant to the Communications Manager Jones, who came from Headquarters to represent Handy. His fine personality and good talk impressed every one. He was followed by some of the route and section managers. Traffic meetings are always interesting as the majority of those attending conventions are "brass pounders" and it gives them an opportunity to become better acquainted and straighten out some of their problems.

Like all well conducted conventions it ended with a very fine dinner and we all enjoyed listening to Capt. Baldwin telling us of his early radio experience on his way to China years ago and Dr. Woodruff of his trip to Paris last year. (We never thought the Doctor was such a "raconteur".) Ole Bill Schweitzer, from Chicago, proved conclusively, after telling us of his trip around the world, that the next national convention should be held in India so as to give us old travellers a chance to see some of the sights.

A convention is never complete without the distribution of prizes for events that have taken place and the Convention Committee gave joy to those present by virtually being able to so arrange the very generous donations of our good friends, the manufacturers who advertise in our *QST*, as to present practically every one with some remembrance. We were pleased to see that on the back cover of the program the firms who coöperated so unstintedly were inscribed on a roll of honor. Give your patronage to those good friends fellows, and those of you who were fortunate to receive a prize be sure to write the manufacturer and thank him for it.

Our thanks also to the City of Straits Radio Club and the Radio Research Club of Detroit who sponsored this convention.

—*A. A. H.*

A Bridge to Measure Capacity, Power Factor, Resistance and Inductance

By J. Katzman*

A MODIFIED form of Wien's Series Resistance Bridge is a piece of apparatus that can be put to exceedingly diversified uses. It may be employed to measure capacities from values as low as a fraction of a microfarad to capacities as high as one microfarad. With it, accurate measurements of the capacity and power factor of condensers may be obtained, inductances of coils may be found, and resistances ascertained. Standard condensers are necessary but no standard of L or R is needed. The accuracy of these measurements depends upon the accuracy of the standards, the care with which the bridge was constructed, and the method and care used in operating the bridge. In most measurements, an accuracy of a tenth of one per cent is obtainable. It is the purpose here to describe and explain the important factors.

Fig. 1 shows a schematic diagram of the bridge connected to measure capacity. The two resistance arms of the bridge R_1 and R_2 must be non-inductively wound and have low distributed capacity and should preferably be equal. In the bridge used in the Dubilier Laboratories, these resistances are each 5000 ohms. R_3 is a resistance box with 10 taps each of 1, 10, 100 and 1000 ohms per tap. Putting it differently, the resistance box has a resistor of 10 ohms with 10 taps one ohm apart another resistor of 100 ohms with 10 taps 10 ohms apart, another of 1000 ohms with 10 taps 100 ohms apart, and one more of 10,000 ohms with 10 taps 1000 ohms apart. This is, therefore, a four-dial box as can be seen in the photograph. It is incorporated within the bridge box, and occupies the forward part thereof.

The resistance of this box may be connected to either side of the capacity arms by means of switch Sw. Condenser C_1 is a standard variable air condenser, of 1500 μμfd. or .0015 μfd. capacity. It has a fine worm gear vernier which permits the setting of this condenser to be read to a fraction of a micromicrofarad. C_x is a condenser whose capacity and power factor is to be measured. The a.c. is supplied by means of a pure 1000-cycle oscillator 0 and is connected to the bridge through a transformer, T_1. Detection of the balance point is made with a pair of headphones connected to the bridge through a transformer T_2. Each part of the bridge is shielded, and the assembly is separately shielded. (The bridge, oscillator, and standard variable condenser are type 216, 213, and 222 respectively, made by the General Radio Co.) Connections to condensers C_1 and C_x are made with leads as short as possible, and during one measurement the same position of these leads should be maintained. For greater sensitivity the output of the transformer T_2 can be amplified by a three stage audio frequency amplifier turned to 1000 cycles, before it is passed to the headphones, as is shown in Fig. 5.

THE APPARATUS AS SET UP IN THE DUBILIER LABORATORIES

From left to right on the table we have a General Radio type 222 precision variable standard condenser, General Radio type 216 capacity bridge, on which stands a box of Dubilier standard mica fixed condensers. To the left of the bridge is a Dubilier condenser which is being measured and on the wall is calibration sheet (Bureau of Standards) for the variable condenser. Suspended from the table is an audio amplifier tuned to the audio oscillator frequency of 1000 cycles and on the floor is a padded sound-proof box containing the oscillator itself. The amplifier and oscillator batteries are respectively under and beside these devices.

GENERAL OPERATION

The scale of the standard condenser is divided into 2500 parts by the fine vernier employed, and excepting for the first three-

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hundred divisions and last one-hundred divisions, the capacity changes very uniformly with each change of setting. In other words it is almost a straight capacity-line condenser between from settings of 300 to 2400. Below 300 and above 2400, the line is not straight due to the edge effects between the fixed and moveable plates at the moment of engaging and disengaging of these plates. This condenser should therefore be used only between 300 and 2400, that is between about 160 μμfd. and 1450 μμfd. It is best to have this condenser accurately calibrated for capacity at points every 100 divisions apart, between 300 and 2400. This can be done by the Bureau of Standards or some other reliable agency. These values may then be plotted on a graph sheet, as shown for part of the scale of a standard in Fig. 2. From this curve the capacity for any reading of the standard condenser may be obtained, or, if the number of measurements to be made warrants it, a table may be constructed as shown in Fig. 3. This table is made up as follows:

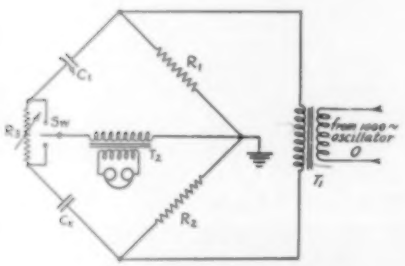


FIG. 1 THE BRIDGE CIRCUIT

T1 and T2 are the input and output transformers which prevent unbalanced effects which would otherwise be caused by direct connections to the oscillator and headphones. R_1 and R_2 are the resistance arms of the bridge while R3 is the decade box as explained in the text. Switch Sw connects this box in the C_1 or Cx branch as desired. C_1 is the standard air condenser or sometimes this condenser in parallel with standard fixed condensers.

As an example, assume the following calibrations:

Condenser Setting	*Capacity*
400	200 μμfd. (.000220 μfd.)
500	282 μμfd. (.000282 μfd.)

Hence the difference between condenser settings = 100 divisions
The difference in capacity = 62 μμfd.
Therefore the capacity per division .....0.62 μμfd.
From which, in the table Fig. 3,
401 on the condenser =220.6
402 " " " =221.2

It is interesting to note that the making up of the table is not as laborious as might at first appear, if the sequence is recognized. Note that the last figures in the vertical columns are constantly recurring, such as 2, 4, 6, 8, 0, or 1, 3, 5, 7, 9, etc. If, therefore, the first row is once found, the rest of the vertical columns may be obtained by adding 6.2 to the figure immediately above the one sought, and checking these values by noting whether there is a break in that series. Of course, a legitimate break should occur where the calibration changes from 62 μμfd. per 100 divisions to some other value.

Now as to the bridge itself. After the connections have been properly made, as shown in Fig. 1, the bridge is ready for the measurement of capacity, but is not quite ready for the measurement of power factor. Regardless of the care taken in the construction of this bridge, the same power factor will *not* be obtained if C_x and C_1 of Fig. 1 are interchanged. This is due to the slight unevenness of the losses occurring in the connections and necessary insulation that is incorporated in the various arms of the bridge. To overcome this difficulty, either two measurements must be made with C_x first on one side and then on the other side of the bridge, and the average of the two results taken, or else a correction for the bridge can be made. Fig. 4 shows such a correction curve. To get this curve, C_x is replaced by any variable condenser. It is then adjusted to balance the standard condenser set at 300. The final adjustment for balance of capacity is then made with the standard condenser, and balance of resistance by means of R_3, Fig. 1. The two condensers are then interchanged and the bridge is rebalanced for both capacity and resistance. The difference between the two

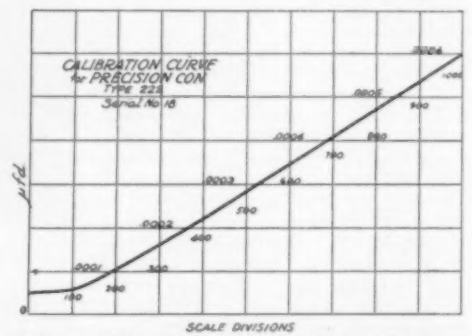


FIG. 2 CALIBRATION CURVE OF A GENERAL RADIO PRECISION VARIABLE CONDENSER LIKE THAT SHOWN IN THE PHOTOGRAPH

On the original large curve sheet the cross-hatching is 10 times as close to permit accurate reading but in a small reproduction these lines tend to run together and are therefore omitted.

readings of resistance divided by two, is the correction for that setting of the standard condenser. The same is repeated for other settings of the standard condenser and a curve is then plotted with these resistance corrections on one axis, and corresponding setting of standard condenser on the other axis. For the first point on curve Fig. 4, for example the standard condenser produced a capacity balance when in the upper arm, and set on 313, and R_3 (Fig. 1) was in the same arm and read 1400 ohms. On interchanging the two condensers, R_3 was again in the arm containing the standard, but now read 180. The difference is therefore 1220 ohms, and half of that is 610 ohms. If it decided that the standard will always be kept on the upper left hand side of the bridge, then 610 ohms has to be *subtracted* from every resistance reading obtained for a condenser of a capacity represented by 313 on the standard. Having a complete correction curve, correction for resistance for any capacity can be obtained. As can be seen from Fig. 4, the correction becomes negligible for large capacities. A new correction curve may be needed every three months or even more often. The user of such a bridge should, therefore, make frequent checks of one or two points to detect any change in losses that may occur and that may vitiate his accurate measurements of power factor.

MEASUREMENT OF CAPACITY

Two methods of measuring capacity need to be employed. One is for the measuring of large capacities, and the other for the measuring of small capacities. For large capacities (160 μμfd. and above), condensers are compared directly with a standard. For capacities between 160 μμfd. and 1450 μμfd. the standard air condenser alone is used. For larger capacities, proper mica standards are added in parallel with the air condenser. Referring to Fig. 1, since the resistance arms are equal, the capacity C_x is equal to the capacity of the standard C_1. When a mica standard has to be used, it should be of a smaller capacity than that of the condenser under tests, and the balance obtained by adjusting the variable air condenser. By the use of the standard variable air condenser in parallel, it is possible to obtain an accuracy equal to the accuracy of the mica standard since the variable air condenser may be set to an accuracy comparable to that of the mica standard. The capacity of the unknown, is of course the sum of all the capacities of the standards used in parallel. From what was said, it is obvious that the mica standards must be well constructed so that they will maintain their calibrations for a long time and thus serve as dependable standards. By means of the substitution method, capacities smaller than 160 μμfd. can be measured accurately. This method is illustrated diagramatically in Fig. 5, which also shows the tuned amplifier. The standard condenser C_s is first adjusted to balance any condenser C. C need not be known, as long

400 - 859

	0	1	2	3	4	5	6	7	8	9
40	220.0	220.6	221.2	221.8	222.4	223.1	223.7	224.3	225.0	225.6
41	226.2	226.8	227.4	228.1	228.7	229.3	229.9	230.5	231.2	231.8
42	232.4	233.0	233.6	234.3	234.9	235.5	236.1	236.7	237.4	238.0
43	238.6	239.2	239.8	240.4	241.1	241.7	242.3	242.9	243.6	244.2
44	244.8	245.4	246.0	246.7	247.3	247.9	248.5	249.1	249.8	250.4
45	251.0	251.6	252.2	252.9	253.4	254.1	254.7	255.3	256.0	256.6
46	257.2	257.8	258.4	259.1	259.7	260.3	260.9	261.5	262.2	262.8
47	263.4	264.0	264.6	265.3	265.9	266.5	267.1	267.7	268.4	269.0
48	269.6	270.2	270.8	271.4	272.1	272.7	273.3	273.9	274.6	275.2
49	275.8	276.4	277.0	277.7	278.3	278.9	279.5	280.1	280.8	281.4
50	282.0	282.6	283.2	283.9	284.4	285.1	285.7	286.3	287.0	287.6
51	288.2	288.8	289.4	290.0	290.7	291.3	291.9	292.5	293.2	293.8
52	294.4	295.0	295.6	296.3	296.9	297.5	298.1	298.7	299.3	299.9
53	300.6	301.2	301.8	302.4	303.1	303.7	304.3	304.9	305.6	306.2
54	306.8	307.4	308.0	308.7	309.3	309.9	310.5	311.1	311.8	312.4
55	313.0	313.6	314.2	314.9	315.4	316.1	316.7	317.3	318.0	318.6
56	319.2	319.8	320.4	321.0	321.7	322.3	322.9	323.5	324.2	324.8
57	325.4	326.0	326.6	327.3	327.9	328.5	329.1	329.7	330.4	331.0
58	331.6	332.2	332.8	333.5	334.1	334.7	335.3	335.9	336.6	337.2
59	337.8	338.4	339.0	339.7	340.3	340.9	341.6	342.1	342.8	343.4
60	344.0	344.6	345.2	345.9	346.4	347.1	347.7	348.3	349.0	349.6
61	350.2	350.8	351.4	352.0	352.7	353.3	353.9	354.5	355.2	355.8
62	356.4	357.0	357.6	358.3	358.9	359.5	360.1	360.7	361.4	362.0
63	362.6	363.2	363.8	364.5	365.1	365.7	366.3	366.9	367.6	368.2
64	368.8	369.4	370.0	370.7	371.3	371.9	372.6	373.1	373.8	374.4
65	375.0	375.6	376.2	376.8	377.4	378.1	378.7	379.3	380.0	380.6
66	381.2	381.8	382.4	383.0	383.7	384.3	384.9	385.5	386.2	386.8
67	387.4	388.0	388.6	389.3	389.9	390.5	391.1	391.7	392.4	393.0
68	393.6	394.2	394.8	395.5	396.1	396.7	397.3	397.9	398.6	399.2
69	399.8	400.4	401.0	401.7	402.3	402.9	403.6	404.1	404.8	405.4
70	406.0	406.6	407.2	407.9	408.4	409.1	409.7	410.3	411.0	411.6
71	412.2	412.8	413.4	414.0	414.7	415.3	415.9	416.5	417.2	417.8
72	418.4	419.0	419.6	420.3	420.9	421.5	422.1	422.7	423.4	424.0
73	424.6	425.2	425.8	426.5	427.1	427.7	428.3	428.9	429.6	430.2
74	430.8	431.4	432.0	432.7	433.3	433.9	434.6	435.1	435.8	436.4
75	437.0	437.6	438.2	438.9	439.4	440.1	440.7	441.3	442.0	442.6
76	443.2	443.8	444.4	445.0	445.7	446.3	446.9	447.5	448.2	448.8
77	449.4	450.0	450.6	451.3	451.9	452.5	453.1	453.7	454.4	455.0
78	455.6	456.2	456.8	457.5	458.1	458.7	459.3	459.9	460.6	461.2
79	461.8	462.4	463.0	463.7	464.3	464.9	465.6	466.1	466.8	467.4
80	468.0	468.6	469.2	469.9	470.4	471.1	471.7	472.3	473.0	473.6
81	474.4	475.0	475.6	476.3	476.9	477.6	478.2	478.9	479.6	480.2
82	480.8	481.4	482.0	482.7	483.3	484.0	484.6	485.3	485.9	486.6
83	487.2	487.8	488.4	489.1	489.7	490.4	491.1	491.7	492.3	492.9
84	493.6	494.2	494.9	495.6	496.2	496.8	497.4	498.1	498.7	499.3
85	500.0	500.6	501.3	501.9	502.6	503.2	503.8	504.5	505.1	505.8

NOTE: Results are in μμfd. for No. 18 Condenser 3/31/25 By J.K

FIG. 3 CHART FOR RAPID READING OF CAPACITY FROM SETTINGS OF THE PRECISION VARIABLE CONDENSER

This chart is one of a series, this particular one covering the range from 400 to 859 on the condenser scale of 2500 divisions. Such a chart is an advantage when many hundreds of readings are to be made, as the use of the curve-sheet then becomes a burden.

as it "stays put." The condenser C_s, the capacity of which we wish to find, is then connected in parallel with C_s, and C_v is reduced till a balance is again obtained. The difference of capacities between the two readings of this standard condenser, is the capacity of the condenser C_x. During the whole test, the leads connecting to C_x should remain as fixed in one position as is possible. While in both these measurements of capacity nothing was mentioned about the adjustment of resistance R_s, it is important that this resistance be adjusted simultaneously with the variable condenser in order to obtain a perfect balance. The more closely the two are set to produce perfect balance, the more accurate become the results.

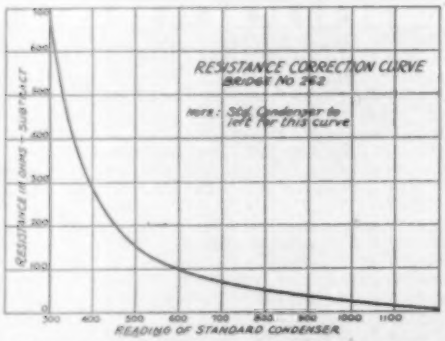


FIG. 4 RESISTANCE CORRECTION CURVE

With the standard condenser thrown to the left the readings are made and from the setting of the standard and the curve sheet the resistance correction is found. This correction is then subtracted from the previous result, as explained in the text.

MEASUREMENT OF POWER FACTOR AND RESISTANCE

The resistance of condensers of equal goodness depends on their capacity, therefore it is convenient to express the goodness of a condenser in terms of its power factor which automatically includes both these factors. Power factors of condensers are usually specified in percent. A one-percent power factor means that the losses of energy is one percent of all the energy supplied to the condenser. Often power factor is also designated by an angle of a certain number of degrees, minutes, and seconds. This angle is known as the Angle of Phase Difference and is that angle whose sine is equal to the power factor expressed as a decimal. In measuring power factor neither of these is directly obtained. Instead, an equivalent series resistance (which we ordinarily speak of as the condenser resistance) is first obtained, from which the power factor is computed. The equivalent resistance is that resistance which if placed in series with a perfect condenser, a condenser that has no losses, will introduce the same losses in the circuit, as would another imperfect condenser or the same capacity and whose power factor is to be found.

If R is this equivalent series resistance and C is the capacity of the condenser in microfarad and P.F. is the power factor expressed as a decimal

$$(1)\ \text{The P.F.} = \frac{C\,R}{159}$$

To get P.F. in percent, this value is multiplied by a hundred. The angle of phase difference may be obtained from a table of sines or tangents, the values of sines and tangents being equal for small angles.

When measuring capacities of condensers by the comparison method as above explained and as illustrated in Fig. 1, the value of resistance of R_s, when corrected by means of the correction curve, Fig. 4, may be assumed to be the equivalent series resistance of the condenser under test if the variable standard condenser alone is used. An error is here introduced due to the equivalent resistance of the standard, but it is negligibly small for the good standard at the larger capacities for which it is used in the comparison method. For the smaller values, (that is below 160 μfd.) it is by no means negligible. But even this error may be corrected for, by obtaining a curve of the equivalent series resistance of the standard, as will be explained later, and adding this equivalent resistance to the correction value of R_s. If additional mica standards are used in the measurement of capacities above the maximum of the air condenser, the effective resistance of all condensers in parallel should be added to the corrected value of R_s.

Let R_e = the effective resistance of this parallel arrangement.
C_1, C_2, C_3, C_4 = the respective capacities of the condensers used in parallel.
$R_1\ R_2, R_3, R_4$ = the effective resistance of the respective condensers.
C_e = the capacity of the parallel condensers combination.

$$(2)\ \text{Then } R_e = \frac{C_1{}^2R_1 + C_2{}^2\,R_2 + C_3{}^2\,R_3 + C_4{}^2\,R_4}{C_e{}^2}$$

The standard mica condensers when calibrated for capacity can at the same time be calibrated for power factor, and from formula (1) the resistance required for formula (2) can be computed.

By the substitution method of measuring small capacities, as shown in Fig. 5, in the first balancing of capacities, a definite reading for R_s is obtained. When the test condenser is introduced and the capacity rebalanced, a different R_s results. This difference of resistances, multiplied by the square of the ratio of capacities, gives the effective resistance of the test condenser.

Let the initial resistance be presented by R_{s1}

The final resistance be presented by R_{s2}

The initial capacity of the variable condenser $= C_1$

the final capacity of the variable condenser $= C_2$

The capacity of the test condenser then $= C_1 - C_2$

and the difference in resistance $= R_{s1} - R_{s2}$

Let the resistance of the test condenser $= R_x$

(3) Then: $$R_x = (R_{s1} - R_{s2}) \left(\frac{C_1}{C_1 - C_2}\right)^2$$

The power factor can be calculated from formula 1.

This same method may be used to obtain the effective resistance of the variable

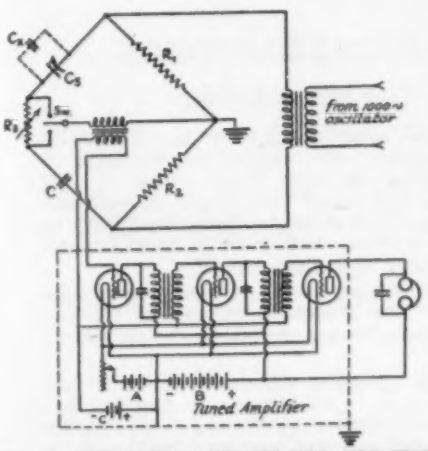


FIG. 5 THE BRIDGE SET-UP FOR USE WITH A TUNED AUDIO AMPLIFIER

Except for the amplifier the connections are the same as before. The amplifier improves the sensitivity and also thereby the accuracy. The bridge is shown as used to measure small capacities shunted across the standard variable capacity.

standard, provided two such standards are available, or one additional good variable condenser. This additional condenser is then used in place of C_s, while the standard is used in place of C_x.

MEASUREMENT OF RESISTANCE

To measure resistance at 1000 cycles between values of 1 ohm and about 10,000 ohms, two condensers are first balanced, and the resistance to be measured is then inserted into one of the arms, as is shown by R_x in Fig. 6 and R_s and C_s are again adjusted to produce a balance. The difference between the two values of R_s is the value of the resistance R_x. The condensers are necessary to prevent overloading of the os-

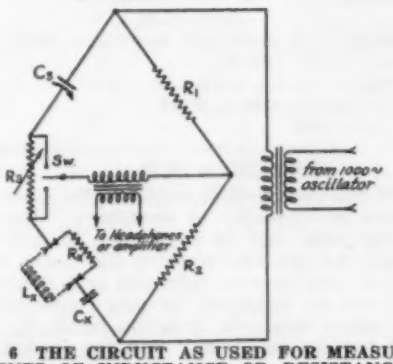


FIG. 6 THE CIRCUIT AS USED FOR MEASUREMENTS OF INDUCTANCE OR RESISTANCE.

With everything else remaining as before the unknown inductance Lx or the unknown resistance Rx is connected in as shown. Naturally the values obtained are those corresponding to 1000 cycles with a small current flowing. All inductances and most resistances change somewhat with frequency and current, therefore the results are not necessarily applicable to other conditions. The same statement of course applies to any resistance or inductance measurement, especially to the latter. As a particular example, the inductance of an iron-cored choke with a small 60-cycle current flowing is one thing; the inductance of the same choke with 40 or 50 mils of d.c. plus 2 mils of a.c. flowing thru it is likely to be quite another and much smaller amount. Failure to understand this prevented many of the early rectifier-filter combinations from working.

cillator when small resistances are used, and to balance out any inductance or capacity of R_x. Of course if a larger resistance than the total resistance of R_s is to be measured, an additional standard resistance box has to be used in series with R_s.

MEASUREMENT OF INDUCTANCE

The method of measuring inductances is based upon the principle that if the inductive reactance is smaller than the capacitative reactance, and the two are connected in series, the combined result is the same as would be obtained by one condenser of larger capacity. If therefore, the capacity of any condenser is first balanced on the bridge, and then the inductance coil, of which the value of inductance is desired, is placed in series with this condenser and the bridge again is balanced, the standard will show a larger capacity. From this increase of capacity, the value of inductance can be found. Referring to Fig. 6, C_x is balanced on the bridge with the standard condenser C_s. The inductance L_x is then connected

in series with C_x, just as R_x formerly was connected, and R_3 increased to produce a balance again.

Let initial capacity of the standard be represented by C_1 in microfarads.

Final capacity of the standard be represented by C_2 in microfarads.

$$\text{Then } L_x = \frac{C_2 - C_1}{39.5\ C_2\ C_1}$$

Thus if $C_1 = .0010$ μfd. and $C_2 = .0011$ μfd.

$$L_x = \frac{.0011 - .0010}{39.5 \times .001 \times .0011} =$$

$$\frac{.001}{39.5 \times .001 \times .0011} = 2.3 \text{ henrys}$$

To use this method successfully, a proper choice of capacity is necessary. The capacity must not be too large. If it is too large, the net reactance in the lower arm, Fig. 6, will become inductive and therefore will not be balanced by *any* condenser in the upper arm. If it is too small, $C_2 - C_1$ will become very small and the results obtained will not be accurate. As can be seen from the above illustrative problem, .001 μfd. is a very good capacity for 2 henry. No fine choice of capacity is however required, and it will be found that .001 μfd. will be suitable for inductances ranging between about .4 henry and 4. henrys.

For smaller inductances, larger capacities should be used, and of course small capacities should be used for larger inductances. If one thinks of the values of capacity or inductive reactance instead of the values of C and L this becomes obvious. When uncertain of the approximate inductance, it is best to start with a small capacity such as .0002 μfd. (which is suitable for about 25 henrys) and if the difference in capacity is small, increase the capacity. The increase in capacity may be made in large jumps such as .0002 μfd., .001 μfd., .01 μfd. and .1 μfd. The last value will be suitable for inductances as low as a fraction of a millihenry.

All these tests may be made easily, and (with a little experience) both quickly and accurately.

That Spirit of Accomplishment

By Hiram Percy Maxim, President A.R.R.L.

I SUPPOSE all of us get a certain question asked every so often. It usually comes from the type of person who wonders why Columbus ever went to the inconvenience of discovering America, or why Peary risked a chill by going to the North Pole or why Charlie Lindbergh risked a perfectly good life in a non-stop solo flight across the North Atlantic from New York to Paris. The question asked of us is why we study and work so hard and sit up so late at night just to hear a faint little whistling sound?

There is no answer to such questions—at least to the kind of person who would ask them. But there is an answer. The answer is, because of the tremendous satisfaction that comes from successfully accomplishing the extremely difficult or the extremely dangerous.

In our case it is the extremely difficult. Human standards are still such that it is considered wonderful to be able to sit in one's home in America and communicate back and forth with a fellow amateur on the other side of the earth. And to be able to do this with apparatus that has been built and installed with one's own hands brings a feeling of exalted satisfaction.

The ordinary mortal cannot do it. It is too difficult. But we can do it. When it becomes easy to do we shall lose our interest in it, however. Witness our record during the past ten years. We struggled with "the useless" 200-meter spark transmission until we mastered it and disclosed its limitations. We took up 200-meter continuous wave because it was better and more difficult. We went down to 100 meters because it was still more difficult, and better for our purpose. We left this for 80 meters. Thence we went to 40, thence to 20 and now we insist that 5 meters shall give up its secrets. And one of us is going to make 5 meters do it, because no one has ever been able to. Who wants to say that one of us amateurs is not going to achieve honors in ultra short wave work that will place his name beside those of Maxwell, Hertz and Marconi? It can easily be that one of us will wake up some morning and find we are another Charlie Lindbergh, with the whole world striving to do us honor.

Army Amateurs in Joint Army-Navy Maneuvers

By David S. Boyden*

THE general scheme of exercises provided that the Black Force, represented by the United States Fleet, had secured command of the North Atlantic and was advancing on the New England coast with an expeditionary force of some 75,000 men in transports. By the limitations of the problem, the area of operations was confined to the coast and adjacent islands extending from the eastern elbow of Cape Cod to the mouth of the Connecticut River.

The defense, or Blue Force, included the land forces harbor defenses and a small Naval Fleet.

The objective was to make a landing of sufficient force to advance on and make a Bridge Head for protection of a large force to land later. The Blue Forces were organized as follows:

The First Coastal Sector included the shore line of New England with its Command Post at Worcester, Massachusetts. It included four sub-coastal sectors of which only the third was involved in the problem of the Blue Forces.

The problem started at 12:01 a.m., May 17, and was concluded by order of the Chief Umpire at 12:20 p.m., May 19.

The Black Fleet made a general reconnaissance on the evening of the 17th, and an air attack and bombardment by battleships on the Harbor defenses of New Bedford and Narrangansett Bay on the afternoon of the 18th. It seized Block Island and raided the Harbor of New London on the night of the 18th and made a land attack along the coast, extending from Sakonnet Point to Salters Point at daybreak on the 19th.

While the official decision of the Chief Umpire has not been made public, it is the consensus of opinion that the Blues withstood the attack and that the Blacks were unable to advance and secure the objective.

THE NET CONTROL STATION, 1WF
Left to right: Chief operator, E. L. Deslauries, 1AWB; 1st Lieut. D. S. Boyden, 1SL; S. B. Waring, 1AZZ; Jefferson Borden 1V, 1CMX.

With this picture before you, we will proceed with the Army Amateurs' activities in these objective.

In accordance with instructions received from the Signal Officer, First Corps Area, the Radio Advisor on Amateur Matters organizes the Army Amateurs within the theatre of operations into three groups:

Group 1—Intercept.

Group 2—Coastal Observation.

Group 3—Net Control Station at Headquarters.

Group 1. The "Intercept" group was located in Attleboro, Massachusetts, and vicinity; as at this location there was an Army Goniometric Station which had a direct telephone connection with the Headquarters of the Third Sub-Coastal Sector at Fort Adams, Newport, Rhode Island.

A telephone connected to the local exchange was installed at the Goniometric

*1st. Lieut. Sig-Res., Radio Adviser on Amateur Matters to the First Corps Area Signal Officer, nu1SL.

Station for prompt relaying of messages intercepted by this group.

The intercept work required a constant listening-in on all frequencies allocated to Government use from 200 kilocycles (133 meters) to 18100 kilocycles (16.6 meters) and to report all messages intercepted except those which were positively identified as being commercial or of a friendly nature. The operators at the Goniometric Station scrutinized all relayed intercepts, filling incomplete messages where possible. 1SE and 1PM were in charge of schedules of listening periods for the various stations, so that as far as possible a continuous service would be maintained in the several intercept bands.

The group was composed of amateurs 1ABT, 1ACI, 1ADM, 1AMD, 1AUG, 1AWB, 1BQQ, 1CMP, 1EX, 1MV, 1NT, 1OW, 1PM, 1SE and 1UW.

The radio silence maintained by the enemy during the first forty-eight hours of the maneuvers made intercept work rather monotonous, but on the third day, enemy messages were reported. The majority of these messages were in Cypher Code and were forwarded to the cryptanalists of the Intelligence Division for decoding.

A few enemy messages were sent in the clear. These were between ships and aircraft and of minor importance. *Nine messages of major importance* were intercepted and reported by this group.

Group 2. This was known as the "Coastal Observation" group. It was composed of Army Amateur Stations located on the New England Coast between Chatham, Massachusetts, New London, Connecticut, the Island of Nantucket and Long Island, as follows: 1APP, 1AFX, 1AIR, 1AOM, 1ANG, 1AUY, 1AYX, 1BE, 1BHS, 1BXV, 1CLV and 2ADW.

Each station secured the assistance of as many scouts as possible so located as to command a view of the waterfront in their vicinity, so that observation would be as continuous as possible.

These observers were to report the approach of enemy forces either by air, water or land by radio to the "Headquarters" Group of the Third Sub-Coastal Sector. All observed information was enciphered by the amateur before transmitting to Headquarters. The work of this group was made very difficult by the weather conditions; fog and rain being encountered during much of the time.

No one except the Blacks knew when and where the attack would be made upon the coast defended by the Blues, therefore, every amateur was on the alert to secure the first information of the enemy's approach. Several stations reported occasional enemy scouting aircraft, and on the second day of maneuvers, the Blacks were discovered off the coast of Buzzards Bay.

1AOM and 1BHS located respectively at South Harwich and South Dartmouth found themselves within the area of active operations. Each of these amateurs was at his key keeping hourly schedules with the Net Control Station Headquarters. On the third day the Black forces attacked the Harbor defense of New Bedford, and vicinity. to effect a landing on the shores between Sakonnet Point and Salters Point. 1BHS was then in constant touch with New Control Station Headquarters, sending in reports as fast as they could be enciphered and transmitted. At 6:50 a. m. on the 19th (E.S.T.) 1BHS reported "things happening so fast cannot report them in cipher code". Upon receipt of this message, the Signal Officer, First Coastal Sector, authorized observation reports transmitted in the clear. And for the next two hours 1BHS reports were received amid great interest and excitement at Headquarters of the Blue Forces.[1]

Group 3. The "Net Control" Station was located at Fort Adams, Newport, Rhode Island, Headquarters of the Third Sub-Coastal Sector. A fifty-watt transmitter was used in an inductively coupled Hartley circuit, using 1100 volts, "S" tube, rectified a.c. on the plates. The transmitter was operated at approximately 800 kilocycles (77 meters) using the call nu1WF. This station was manned by Army Amateur operators from Newport and vicinity, the

1. For their exceptionally excellent and unremitting work during the exercises, 1AOM and 1BHS have received special commendation in the report made by Major Evans, First Corps Area Signal Officer.

volunteer personnel being: 1AQQ, 1AUG, 1AWB, 1AWG, 1AVM, 1AZZ, 1BQD and 1CMX.

During the maneuvers, the operators worked in pairs four hours on and eight off, maintaining a constant listening-in for reports from stations of the Coastal Observation Group.

The first visual contact with any of the Black Fleet by land observers was obtained by an Army Amateur Station. At the close of the exercises, Commanding General of the Blue Forces, Major General Preston Brown, and Signal Officer First Corps Area, Major P. W. Evans, commented favorably on the part the Army Amateurs performed in these maneuvers. A commendatory letter was sent to each by the Signal Officers.

The result of the Army Amateur activities in these exercises proves the Amateur Radio operator to be a potential factor who can be relied upon as an aid to our armed forces in the event of an emergency.

The amateurs participating were selected by their geographic location without consideration of their operating ability. From an analysis of these operators and applying the percentages to the licensed amateurs of the United States, it would appear that there are 14,000 amateurs having a speed of over fifteen words per minute and 1400 amateurs having a speed of more than twenty words per minute. In addition, the majority of amateurs are familiar with the technique of radio communication apparatus.

It is hoped that Army Amateur personnel[2] will be utilized in the future on every possible occasion of this character that they become familiar with Army methods and radio procedure. Attention is invited to the excellent work performed by all coöperating amateurs.

2. If interested in participating in the Army Amateur Nets that have been formed in various parts of the country, send your application for appointment as Army-Amateur Radio Station to A.R.R.L. Headquarters and it will be forwarded to the attention of the proper Corps Area Signal Officer via the Army Amateur Representative of that Corps Area. It is not necessary to enroll in the Signal Corps to get in on the interesting Army-Amateur activities.

1BIG, 1KL, 1BMS and a number of other amateurs enrolled in the Naval Reserve (the number is not definitely known at this writing) were with the Black Forces making the attack on the New England Coast.—F. E. H.

MAKING A LOG ENTRY

Western and Central New York Atlantic Division Convention

PLACE: Powers Hotel, Rochester, N. Y. Date: Friday and Saturday, August 5th and 6th. Price: $4.50 will buy Convention ticket which includes everything. No extra fees.

This convention will be put on by the Society of Rochester Transmitting Amateurs, and is the sequel to the one held at Utica last year.

The program consists of Traffic and Technical sessions, trips to Stromberg Carlson and Bausch and Lomb, (where QTZ crystals are ground), plenty of sports, and finally the Banquet, for which we have some good speakers lined up. A long list of prizes will also be awarded for stunts and contests.

Get your ticket now from R. H. Lucia, Secretary Convention Committee, 109 W. Chestnut St., East Rochester, N. Y.

Indiana State Central Division Convention

COME to the Elks Auditorium, fellows, where this year's convention will take place. The Radio Traffic Association is the sponsor and *entertainment* will be the keynote for the two days.

The committee informs that an initiation into the Imperial Order of the Yellow Dog will take place. There will be prizes for everyone and the fee for the whole convention is $5.00.

It will help the committee if you write Fred W. Fischer, 1114 Crescent Ave., Fort Wayne, Ind., and tell him that you will be there.

Strays

It is claimed by 9MM that a 200-A detector tube will improve matters if you are using a 201-A and are bothered with an audio-frequency hum from the power line.

4NE says he has been having a lot of trouble with spider webs. They are spun from the lead-in to the side of the house and when covered with rain or dew, partially short the antenna system. Perhaps the fact that his name is John H. Webb has something to do with it and perhaps not.

We are told by 8CNR that the use of Xmas tree bulbs across the filaments may be considered as good insurance against burn-out from high plate overload. He blew his lamps three times preventing his CG1162 from continuing a Westward journey.

Some Light on Transmitter Tuning

By Ross A. Hull*

A GREAT deal may have been written during the last few years in explanation on transmitter adjustment. Much more information may comprise the general knowledge of even the relatively inexperienced amateurs. However, after listening for an hour or two on any of the amateur wave bands, one would never think so. One is tempted to believe instead that the typical amateur of these days thinks of tuning as a means to but one end; the end being on the far side of the antenna meter scale.

And in case you imagine that I exaggerate, reach over right now and switch on the old 40-meter noise box, with your mind rearranged along critical lines. Drift slowly from one station to another and make a list of only those signals to which you would be proud to tack your call. If you have the power to differentiate between the clean-cut snappiness of worthwhile signals and wabbly chirps or raspy rattles your list will be small, dismally small. And now, in the same critical frame of mind, try to visualize the fellow behind one of those snappy signals. It should not be difficult. Try in contrast one of those silly sloppy signals. Listen to the key chirps, the shaky wave, the crazy rattle, and, if you are quick enough, follow the thing as it slides out of audibility when the "op" leans over to squeeze that final point into the antenna before his next parade of CQ's. "Jimminny", you'll think, "must be an awful dumb-bell, that chap—careless bozo to put out such a noise". And in all probability you'll be quite wrong. The fellow behind the signal will be, perhaps, just as much of a genuine amateur as you are, with just the same pride in his station and the same desire to own a really fine signal. No doubt he thinks he has one. The overenthusiastic guy that he worked last night is certain to have told him that his QSB was "veri FB," his wave "veri FB" and his keying not a scrap less than "veri FB". And our wabbly-note friend probably has eaten it all up!

And, while we're on the subject, what sort of a signal have you? Have you ever heard it with your own pair of "cans" or do you rely solely on the dizzy "FB's" of others?

THE MONITOR-BOX USED TO CHECK THE CHARACTER OF THE SIGNAL

Taking into consideration the curiosities to be heard on the amateur bands it has not been surprising to find that very few amateurs realize that it is possible to know exactly what their own signals sound like. They will take great trouble to rig an elaborate antenna and a splendid receiver, they will fuss with the wiring and the appearance of the gear, but the *signal*—that part of the station that exhibits itself over the whole globe—*they will disregard entirely.* Is it any wonder that the amateur bands are filled with weird and horrible noises?

So, let us delve into the work of adjusting the transmitter, not with any hope of expounding new or original principles but simply with the idea of explaining the method of obtaining a truly readable signal, irrespective of whether it is "a.c." "r.a.c." or "d.c."—the sort of a signal that will be described in glowing terms by even the truthful DX man.

DO YOU KNOW THIS?

The essential first requirement is a means of listening to the signal right at the transmitter, and, lest you forget it, I will whisper a little known truth. *It is thoroughly and completely impossible to adjust the transmitter satisfactorily unless one can hear it and twiddle the knobs at the same time.*

Obviously, it is impractical to tune the receiver to the fundamental of the transmitter, but often when tuned to some odd harmonic, the receiver will serve to make the transmitted signals audible. More often

* A.R.R.L. Information Service and Experimenters' Section.

the harmonic will be submerged in a background of noise caused by the plate supply machine or by radio-frequency energy arriving through power-supply wiring. Often, too, the harmonics will not be similar in character to the fundamental, nor will they

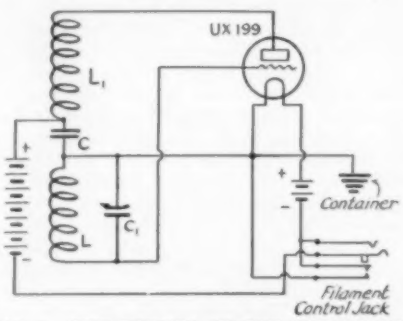


FIG. 1. THE WIRING OF THE "GROWLER" OSCILLATOR

L and L1 = 5 and 9 turns of 22 gauge for 20 meters. 12 and 15 turns of 22 guage for 40 meters. 26 and 26 turns of 30 gauge for 80 meters. Coils wound on a bakelite tube socket.

C—1000 micro microfarads.

By connecting an antenna to the grid through a "Midget" condenser, placing a 50,000 ohm variable resistance in the "B" battery lead for regeneration control and adding a grid leak and condenser the oscillator can be converted into a particularly appropriate portable receiver for camping expeditions this summer.

bear much resemblance to each other. The desirable arrangement is a simple screened oscillator tuned to the *fundamental* of the transmitter and located in such a position that the head phones can be worn conveniently as adjustments are being made. Such an oscillator can be assembled from the junk box of most stations in the space of a few hours, and is quite certain that if every amateur station was equipped with one, many of them would close down from sheer shame, and the amateur bands would no longer *sound* like the playground of painfully indifferent and irresponsible ether-busters.

There is nothing complex, curious or costly about the oscillator, so let us proceed.

A "GROWLER" OSCILLATOR

Clasping the right hand securely around one quarter[1] and striding firmly into the nearest hardware store, negotiate for the purchase of one shielded container (variously styled "Billy Can", "Billy", "Bucket" or "Growler"). This will provide an oscillator housing of both esthetic and electrical merit.

The remaining equipment includes a UX-199 with the essential rubber suspension, a variable condenser of about 150 micro-microfarads, an inductance built according to the details given below the wiring diagram, and filament and plate supply batteries. The filament supply can well consist of a 4½-volt C battery whilst the plate supply can be obtained from a miniature 22½-volt B battery of the type designed for loads of less than 10 m.a. If the jack (to be seen mounted on the side of the can) is arranged to switch the filament circuit, matters will be simplified since it will be possible to plug the head phones from the receiver to the oscillator without the need of any other operation. Should the transmitter be arranged to operate on more than one band the inductances can be wound on a bakelite tube base and plugged into a tube socket or can be of the more usual type hitched to four binding posts mounted in a row on a narrow strip of bakelite. The wiring should present little difficulty though care should be taken to see that other than grounded leads do not make contact with the surface of the container. The need for care even in this regard has been reduced in this oscillator by connecting the negative side of the plate battery to the grounded side of the filament. Therefore, in order to avoid a filament eruption it is only necessary to keep the positive filament lead well insulated. The tuning condenser is connected across the *grid coil only* so as to allow the grounding of its frame. If the condenser is wired

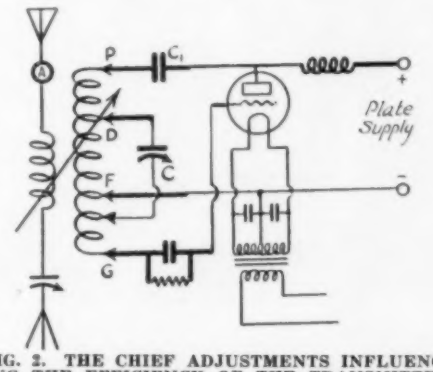


FIG. 2. THE CHIEF ADJUSTMENTS INFLUENCING THE EFFICIENCY OF THE TRANSMITTER ARE SHOWN IN HEAVY LINE

This is contrary to the usual *QST* practise, which is to use heavy lines to indicate wires carrying radio frequency currents.

across both grid and plate circuits, as is so often done, it will be very difficult if not impossible to avoid "hand-capacity" effects. The exact arrangement of the apparatus in the "Growler" is a matter of little importance, or wires associated with it, do not "shimmy" since the slighest vibration will destroy the truthfulness of the resultant signal. It will be hard enough to check and eliminate "shimmies" in the transmitter

1. An American coin often referred to as "two bits".

without having to make allowance for one in the oscillator.

And now, with a 199 plunged into the socket, the "Growler" monitor-box should oscillate in readiness for the grand showdown.

POWER SUPPLY REQUIREMENTS

In order to tune even the simplest transmitter, it is necessary or at least highly desirable, to know the purpose of each of the knobs and clips provided. In the modern amateur station apparatus, controls and adjustments have been reduced to something closely approaching the absolute minimum and, as a result, it is impossible to expect the transmitter to make its best performance unless each one of them receives careful and intelligent attention. In every tube transmitting circuit, there is provided a source of plate supply and a source of filament supply. Apart altogether from the character of this supply, there are considerations of the greatest importance in the work in hand. The plate supply, for instance, irrespective of whether it is "a.c." "r.a.c." or "d.c." must

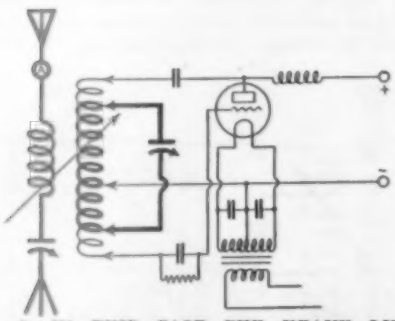


FIG. 3. IN THIS CASE THE HEAVY LINES INDICATE THE FACTORS TO WHICH PARTICULAR ATTENTION MUST BE GIVEN WHEN AIMING AT A STEADY WAVE

be constant. Further, the plate supply must have good regulation. In other words, the voltage must remain fairly constant even though the output load is varied over wide limits. If the voltage delivered by the plate supply drops to 75 or 50 percent of its no-load value when the load is on—as is so often the case—it will be possible to avoid key-chirps only by using some system of keying which allows the tube to take full power during both characters and spaces. This arrangement is usually most undesirable.

A transformer of ample rating, a rectifier system—if one is used—working below its maximum capacity, and filter chokes of low resistance are absolute necessities.

Of equal importance is the constancy of the filament supply. In many cases where the high voltage transformer serves in the dual role of plate and filament supply the filament voltage is dropped whenever the load is placed on the high voltage windings. Key-chirps are the result. In the low-powered transmitter a separate filament transformer is the cure, but even this provision is not sufficient in a high-powered outfit operating from an overworked 110-volt line. In such a case, some form of compensating winding on the filament transformer is often used.

Troubles from either of these sources can be detected very simply, of course, with the aid of voltmeters. They can be detected with equal ease and with less expense, however, by listening to the transmitter with the "Growler" oscillator.

If it happens that a "d.c." note is desired, the filtering of the plate supply is a matter of prime importance. It would be quite useless, however, to attempt to add anything useful to the material on this subject to be found in recent issues of *QST*[2] or in the Handbook.

WHAT THE KNOBS DO

To proceed to the transmitter proper we find that provision is made in it to tune the plate circuit of the tube to the required wavelength, to tune the antenna circuit to resonance with the plate circuit and to vary the amount of energy fed into the grid circuit from the plate circuit (the grid excitation). Other means are provided to adjust the grid bias, to match the impedance of the plate circuit with the output impedance of the tube, and to adjust the antenna load to that value which will allow the most efficient transfer of energy from the plate circuit. Some method of making all of these adjustments is to be found in every satisfactory circuit. In fact a circuit is nothing more than a combination of the necessities for making such adjustments. Trouble is ahead when the time comes to twiddle all of these adjustments in order to get the largest possible output, without exceeding the limits of the tube, and always maintaining a steady clean-cut signal. One would never believe this to be so after reading of the process in any good text book. It would seem that so long as a couple of elaborate equations were satisfied nothing could result except an output of the highest character, and an efficiency to be envied. One cannot help

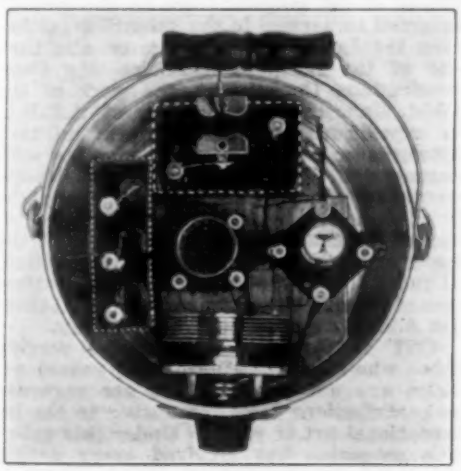
2. "Amateur Filter Problems", Dec., 1925; "Key Thump Filters", Nov., 1925; "Filtering the Synchronous Rectifier", Feb., 1926; "Electrolytic Filter Condensers", April, 1927.

wondering if the writers of some of our text books, plumped down in a typical modern amateur station, could, with equivalent ease, do away with the chirps, wabbles, and key thumps which they ignore so delightfully.

And here's a chance to reiterate my contention that this work can be accomplished satisfactorily only by watching the meters *and at the same time listening to the signal.*

TUNING FOR EFFICIENCY

Let us consider first those tuning adjustments which influence the efficiency of the transmitter. In Fig. 2, a typical Hartley circuit, the dark lines indicate the apparatus and adjustments to which particular attention must be given when aiming to improve the relation between input and output. Starting from the power side of the transmitter it will be found that the radio frequency choke usually will provide a reward for any care given to it. A simple check is to touch the choke lead to the plate with the metal end of a wooden handled screw driver (when a spark should



THE INTERNALS OF THE MONITOR-BOX
Showing one arrangement of the apparatus in the post-prohibition adaption of the "Growler".

be seen) then touching the power side lead from the choke. The spark at this end should be extremely slight, if not entirely absent, and naturally the size of the choke should be varied until such a result is obtained.

Of even greater importance is the adjustment of grid excitation provided by the filament clip. As this clip is moved toward the grid end of the inductance the plate current will be reduced, though this reduction of input power will not be accompanied by a proportional decrease in output power until a certain minimum of grid excitation has been passed.

Of almost equal importance is the resistance of the grid leak. A very approximate statement of the case is that the higher the grid leak resistance the better the efficiency, though, admittedly, the wave

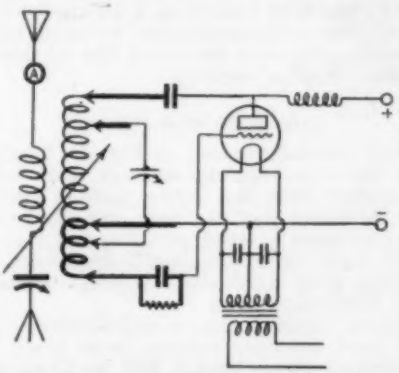


FIG. 4. THE CHARACTER OF THE NOTE AND KEYING CAN BE VARIED TO A SURPRISING DEGREE BY CAREFUL MANIPULATION OF THE ADJUSTMENTS SHOWN BY THESE HEAVY LINES

form under conditions of very high efficiency so obtained may result in particularly heavy harmonics. The usual procedure in the United States, however, of hitching in 5,000 ohms, apparently with the thought that this is the most desirable value, is not to be commended. When efficiency, and its associates—steadiness, note and keying—are the objectives, 10,000 and often 15,000 ohms is the desirable value. Cordespondingly high values are necessary when the higher impedance UV-852 or "H" tubes are used.

The matching of plate output impedance with the tube impedance—a further important factor—is controlled chiefly by the ratio of the capacity of C (Fig. 2) to the inductance across which it is connected, the position of the clip D relative to clip P and the value of the condenser C_1. These values, together with the antenna coupling, should be varied over wide limits while watching the plate meter, the antenna meter *and at the same time listening with the "Growler" to hear what is going on.*

TO OBTAIN A STEADY WAVE

As is illustrated in Fig. 3, the steadiness of the wave is influenced by the mechanical stiffness of the antenna system, the mounting of the inductances, the antenna coupling and the capacity-inductance ratio in the primary circuit. By operating with a small inductance and a large tuning con-

denser—say 500 micro-microfarads on 40 meters—the most striking stability can be obtained even with fluctuating supply voltages and a shaky antenna system. Heavy conductors and a very excellent condenser in the oscillatory circuit are essential, and some power may be sacrificed. At the same time, the result is decidedly worthwhile.

And lest it be forgotten, I will insist that all of these adjustments can be made satisfactorily only with the aid of the "Growler" or some similar oscillator.

THE NOTE AND KEYING

And now take a look at Fig. 4. Neglecting the filter system entirely, and apart altogether from the keying method used, it will be found that the note and the keying are tied hand in hand with filament voltage, grid leak resistance, grid condenser capacity, grid excitation, antenna coupling and antenna tuning.

When "bright" (tungsten) filament tubes are used, filament voltage is of great importance. Sometimes it will be found that the rated voltage is sufficient, but unfortunately it is often impossible to clean up the signals unless the normal rating is exceeded. The alternative is to increase the grid leak resistance, when the desirable condition will be reached with lower filament brilliancy. The modern "dull" (oxide coated or "XL") filaments are not nearly as critical in this regard.

Passing over the grid excitation and adjustments in the grid circuit, to which reference has already been made, emphasis must be placed on the matter of antenna coupling. Aside from considerations of efficiency it will be found that this coupling has the most marked effect over key chirps, key thumps and the note. By varying the coupling and antenna tuning, points will be found where the note clears, where chirps disappear, and where thumps are greatly reduced. It is often difficult and sometimes impossible to combine all the necessities in one adjustment but the "Growler" will serve to indicate a practical mean. Antenna tuning also must be observed with particular care. In some cases severe chirps or a mushy note found on one side of the resonance point will disappear when resonance is approached from the other side!

Of course the conditions in all transmitters will differ very greatly and consequently it is quite impossible to give detailed instructions that will hold good in all cases. The entire purpose of this article will have been fulfilled, however, if it has indicated the relatively unknown field for the improvement of amateur stations provided by the ordinary knobs and clips. And it surely is relatively unknown! Out of four-hundred queries received by the Information Service relative to this very matter during the last five months not more than two inquirers indicated any knowledge of the fact that the note and keying are influenced by factors other than the filter and keying system. What a display of clean cut, worthwhile signals the amateur bands would be if all the world's amateurs listened to their own signals and studied them!

Concerning *QST* Contributions

OCCASIONALLY a contributor does not understand the peculiar situation of *QST* and therefore it seems wise to explain that this magazine is, as the latter part of its title says, "devoted exclusively to amateur radio." It is not required to pay dividends to stockholders as most magazines are. The income which could be used in that way is, instead, used to operate an Information Service and to support the American Radio Relay League which has no other income. Since each subscriber to *QST* is also a member of the A.R.R.L. the profits of the magazine are in the end all returned as service to the subscriber, either thru the Information Service or else thru one of the League's activities—the Communications Department, the work of the Field Man, the participation of A.R.R.L. in expeditions, emergency work, military networks or transmission experiments with commercial firms or government departments and finally thru the less easily defined kinds of work such as the representation of the amateur in his dealings with the government or his contact with international radio and in the experimental investigation of the new things in radio. In all these the A.R.R.L. has an honorable history.

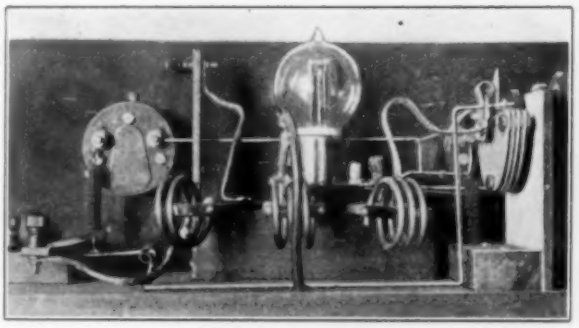
QST is therefore a magazine serving those who support it. For that reason articles are not paid for but are regarded as contributions from the author to the international art of radio. Under this policy this magazine has received every article printed during its history.

—*R. S. K.*

An Investigation of the 5-Meter Band

By E. M. Guyer and O. C. Austin*

THE ORIGINAL objective was in an entirely different direction when the high frequency work was undertaken. An immediate need of a high frequency generator compelled us to investigate the use of a vacuum tube in obtaining the desired frequency. With the common type of tubes such as the 201-A, the 20-meter band was easily reached. At a wave length of 18 meters, using the series fed Hartley circuit, we experienced our first difficulty. In measuring the frequency, we had been using a two-turn coil shunting a 50-μμfd. variable condenser which had been roughly calibrated to 50 meters. Below that, we had been merely guessing at it. The two-turn coil was now abandoned and a one-turn coil substituted. We roughly computed its range as being from 1 to 10 meters. We were able to tune this tank circuit to that of the transmitter and we felt reasonably sure that our transmitter was oscillating in the neighborhood of 5 meters. A two-wire Lecher system was set up and we endeavored to measure our wave by this means. The ends of the two-wire system were connected to a coupling coil which in turn was coupled quite closely to the inductance of the transmittter. In locating the nodal points, it was found that after locating two with a shunt of wire the space between the shunts could in turn be divided, indicating that the system was rich in harmonics. As our two-wire system was only about 8 meters long we could not be sure of our exact wavelength. By computing the inductance of the one-turn coil across our condenser, it was found that we had the transmitter tuned to approximately 17 meters. Loosening the coupling remedied the situation. No further trouble was henceforth experienced and 201-A tubes were made to oscillate down to about 1.3 meters. About this same time, Kruse came out in the 1924, October issue of *QST* (Vol. 8) with details of a 5-meter transmitter and plans for communication on this amateur band. A new transmitter, No. 1, (the original being a "hay-wire" set up), was built, also a receiver to match it, and put on the air with no results. A transmitter had also been built at 9EK, the same set being used for receiving, and an attempt made to communicate with 9AKR. Although the two stations were only about three miles apart, nothing was heard at either station. This was probably due to a difference in frequency as the transmitter at 9AKR was very crude, very little attention being given to the problem of tuning the transmitter, faults in receiver design, etcetera. In the course of events, four transmitters and two receivers operating on the 5-meter band were constructed. No actual communication was carried on and that phase of it was dropped. Stability of the No. 3 transmitter was then investigated. The transmitter was set up in a large room and filament and plate current supplied. Another transmitter, No. 4, was put along side and tuned to beat with No. 3. A crystal detector was used to pick up the beat note. It was found that both temperature and humidity varying from day to day seriously affected calibration. An additional body or mass introduced into the room also shifted the frequency. An attempt was made to shield the transmitter, and this helped some, the shield having to be made "watertight" before any degree of steadiness could be obtanied. The frequency variation by temperature and humidity was proved by placing one of the transmitters under a glass



5-METER TRANSMITTER NO. 1

In the photo may be seen the following:

Milliameter—0-50

Antenna coupling coil consisting of 2 turns of No. 4 bare copper wire.

Plate coil consisting of 3 turns of No. 4 bare copper wire with movable tap.

Grid coil consisting of 3 turns of No. 4 bare copper wire.

V.T. is a W.E. No. 216-A.

Plate stopping condenser is a 3-plate variable condenser.

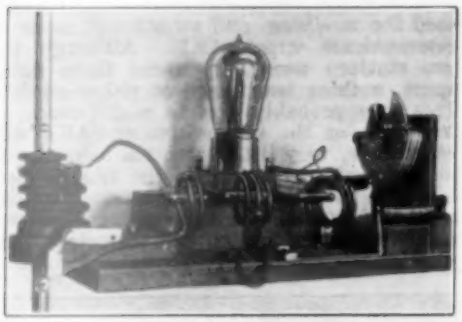
Radio frequency chokes are wound on a ½-inch diameter and have 20 turns. They are put in all filament and plate leads.

Plate source was from about 200 volts of Burgess "B's". Tuning was done by changing number of turns on plate and grid coil. Antenna current was about .4 amp. This set was the result of the "hay-wire" laboratory set.

The circuit was a series fed Hartley.

* 9AKR, 206 N. Orchard St., Madison, Wisconsin.

jar and introducing a small amount of H_2SO_4 (sulphuric acid). Lack of time prevented any additional characteristics being worked out.



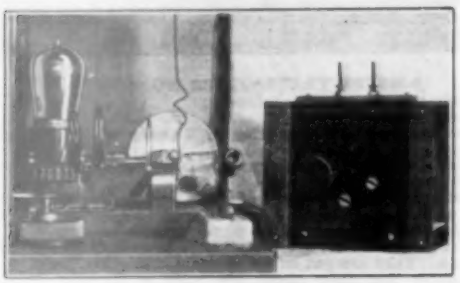
5-METER TRANSMITTER NO. 3

Very similar to No. 1 with the exception of the antenna system. Hertzian system used consisting of 2 brass tubes, each 762 cms. long.

Antenna tuning condenser and ammeter have been removed from set. Antenna current of No. 3 was about .7 amp. using a 5-watt RCA tube with 350 volts on the plate.

The circuit was the series fed Hartley.

A magnatron type of tube would be much more suitable for waves around 2 meters



5 METER TRANSMITTER AT 9AKR NO. 4

Circuit series fed Hartley tuned with a two-plate condenser across the grid and plate of the tube. Picture shows set shielded with copper screening. This had very little effect on stabilizing the frequency. The two-plate mounted condenser with an extension knob shown alongside of the set was used as a wavemeter. One turn of No. 9 copper wire connected to the two terminals.

as a current of a few amperes would control the tube's electron emission. A tube of this type is now being constructed, and I hope to be able to continue high frequency work below one meter.

CHARACTERISTIC CURVE

The Hudson Division Convention

A SECOND annual convention of the Hudson Division of A.R.R.L. was held at the Hotel Pennsylvania in New York City on June 3d and 4th.

The usual meetings, contests and banquet were held, talks being made by Army representatives, the Directors of the Hudson and Atlantic divisions and by members of the Communications Dept. organization of the Division, also by President Maxim and by members of the headquarters organization of A.R.R.L. The technical program consisted of a very excellent antenna demonstration by R. B. Bourne of 1ANA and some talks by several men from A.R.R.L. headquarters. Mr. Bourne's talk unfortunately cannot be reproduced on paper but other talks will appear in *QST*, one being found in this issue. The ¾-meter amateur band was formally opened for A.R.R.L. use by a demonstration message at the Saturday afternoon meeting, staged by Kruse from *QST* and Boyd Phelps of 2EB. The banquet that night, with President Maxim as principal speaker, concluded the affair.

Strays

Here is a suggestion from 9KB for those who are trying to adjust the position of the feeder in a single wire feed line. The biggest obstacle in this work is the lack of communication between the man at the set and the one on the roof and this may be overcome in a simple manner. Two ordinary head sets are connected together with a piece of lamp cord or any other double conductor that is long enough to reach from the set to the roof. One phone of the head set is taken out of its holder and used as a "transmitter" and the other is worn in the normal fashion. If necessary, a 4.5 volt "C" battery may be placed in the circuit to boost the signal strength but good results will be obtained without this. It certainly helps in this sort of a job.

If you are using the new 852 transmitting tube, be sure to twist together the double leads from the plate and grid. Otherwise, if only one of these leads is used, there is apt to be considerable heating that may prove disastrous. The twisting should extend right to the glass seal but be sure you don't get too enthusiastic and break both off short.

The Radio Engineering Labs have strayed from their old quarters in N. Y. C. and are now located at 100 Wilbur Avenue, Long Island City, N. Y.

Radio Frequency Sparking Distances

By Alexander Nyman*

OF the different means for measuring radio frequency voltage the spark gap is probably the simplest, and most satisfactory means when the voltage is anywhere in excess of 1000 volts. Its main advantages are that it can be operated at any frequency and that the current it draws from the line is entirely negligible, even at the highest frequencies, running into several thousand kilocycles, and that the simplicity of construction and cheapness can place it in the hands of most of the experimenters.

Figure 1 shows an experimental spark gap which has been used with much satisfaction in measuring the voltage, for tests on insulators, condensers and other high frequency transmitting appliances.

It will be seen that it consists of a micrometer type sphere gap, where the two gaps are separated by long pyrex glass tubes and shielded with a cylindrical copper shield connected to one of the terminals (this shield is shown in a raised position to expose the sphere gap).

It is of course necessary to supply specially good insulation at radio frequency, as any dielectric strain is liable to cause rapid deterioration in any such insulating materials as wood, bakelite or hard rubber. It is for this reason that pyrex glass was chosen as the main supporting element. It is also evident that long rods of this nature would give very low capacity to the instrument.

Although this is not shown clearly in the picture, the metallic parts on the top which are exposed are carefully rounded off to prevent corona.

The sheet copper clamps holding the glass tubes are all turned with their sharp edges inwards, so that there is no corona on these edges. In use the lower terminal is generally rounded and the micrometer screw is operated by means of a long glass rod with a piece of rubber tube at the end.

One way of operating the device is to set it for a certain spacing which has been determined experimentally as the setting for a definite voltage, and then raising the voltage of the supply until it sparks across the terminals. The other way to use the device is to measure the voltage in the circuit by turning the micrometer screw very slowly until a spark occurs.

Repeated sparks on the same sphere gaps would gradually occur at lower voltages because burning or pitting occurs on the spheres if the voltage is not disconnected immediately. However, if the surface of the spheres is cleaned with fine emery cloth before every discharge, the sparking distance remains consistent.

To overcome this difficulty it is possible to arrange a small air blast next to the gap, conducting the air by means of a glass tube and blowing out the little arc that follows the spark. With such an arrangement the sparking distance was maintained constant for an indefinite number of discharges.

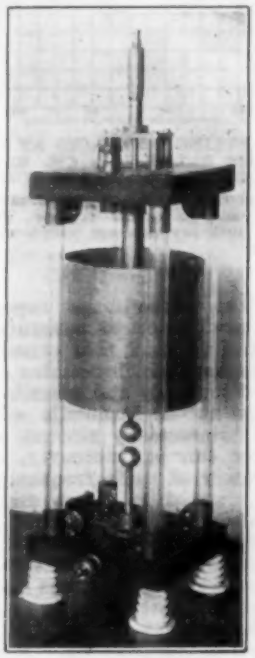


FIG. 1—SPHERE-GAP VOLTMETER FOR HIGH VOLTAGES AT LOW OR HIGH FREQUENCIES

The upper sphere is carried by a rod operated by a micrometer head which may be taken from an ordinary "mike" or purchased separately. The lower sphere is mounted solidly. One or the other must be screwed on its rod so that the micrometer head can be made to read zero when the balls just touch. The size of the apparatus may be judged from the fact that the balls are 2cm. in diameter and the micrometer head is standard.. The copper shield is normally dropped down to the base and connected to the lower ball.

It was soon found that the d.c. or 60-cycle calibration of sphere gap were *entirely inaccurate* at radio frequency and considerable effort was exercised to secure correct calibration at radio frequency. For

* Dubilier Condenser Corporation, 4377 Bronx Boulevard, New York City.

this purpose it was necessary to be able to establish definitely the voltage in a radio frequency circuit and then measure the sparking distance for that voltage. Such definition of voltage can be obtained by using a condenser of known capacity and passing through it a current of definite magnitude. The reason the capacity was chosen in preference to resistance or inductance was the fact that capacity is one electrical element which remains almost unaffected by frequency and permits considerable voltage at the terminals without dissipation of unnecessary amount of energy. A condenser can be, moreover, calibrated very accurately at radio frequency, that is, its capacity would be known exactly.

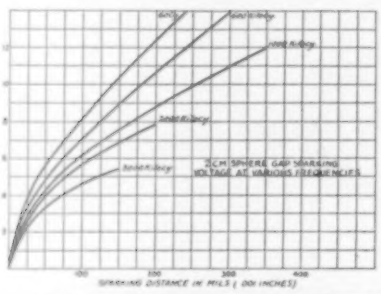


FIG. 2—SPARKLING DISTANCES AT DIFFERENT FREQUENCIES BETWEEN 2 CM. BALLS WITH CLEAN, SMOOTH SPARKING SURFACES.

For very precise work corrections must be made for moisture and barometer reading. For ordinary weather and ordinary amateur requirements this is not necessary.

The measurement of current affords a certain amount of difficulty, but with the development of devices for this purpose, in which considerable progress has occurred during recent years, it is possible to measure this current very accurately at the highest known frequencies. Moreover, it is possible to check the voltages at the same frequencies on different condensers with different currents. For instance, a current of 25 amperes would give, at 100 meters, 5300 volts on a capacity of 250 μμfd. With a capacity of 500 μμfd. the same voltage would be obtained at 40 amperes, while with a capacity of 100 μμfd. the same voltage would be obtained with 10 amperes. If all of these readings are consistent, we have a check on the methods of measuring the capacity and the current and an indication that they are satisfactory.

The curves of Figure 2, give a calibration up to a frequency of 3000 kilocycles. It will be seen that the higher the frequency, the longer is the sparking distance. This is a very usual experience in radio frequency operation, and applies not only to the sphere gaps but to the sparking distances through insulation, over the surfaces of insulation and from sharp points.

In conclusion, it may be stated that this method probably requires less expert attention than any other method of measuring voltages, providing a calibration curve is used. However, care must be taken to locate the sphere gaps in a place where the influence of the rest of the radio circuit is not likely to create corona losses or excessive distributed capacity. As a rule a spacing of two or three feet from the inductance coil is sufficient. Another precaution which it is advisable to take is to have means to disconnect the sphere gaps or else cut off the power supply immediately after a spark occurs. With these two simple precautions the use of this device is both reliable and consistent.

A.R.R.L. Information Service Rules

Please help us by observing the following rules:

1. Keep a copy of your questions and diagrams and mention that you did so.
2. Number the questions and make a paragraph of each one.
3. Make diagrams on separate sheets and fasten them to the letter.
4. Print your name and address (not merely your radio call) on your letter. Don't depend on the return address on the envelope as this is destroyed when the letter is opened.
5. Don't ask for a comparison of the various manufacturers' products.
6. Before writing, search your files of *QST—the answer probably is there.*
7. Address all questions to Information Service, American Radio Relay League, Inc., 1711 Park Street, Hartford, Conn.
8. It is not essential to enclose an envelope as long as you supply postage and PRINT CLEARLY your name and address on your letter.

Strays

A suggestion by 8AG is that the lamp used for indicating resonance in the wavemeter be placed behind the illuminated dial. When resonance is reached, the lamp will light up and allow the reading to be taken as it will illuminate the dial at that time.

Those of you who have been looking for the "trig functions" in the working out of the "How Far Is It" problems can find them on page 457 of the I. C. S. Radio Handbook. Thank 5WY for the dope.

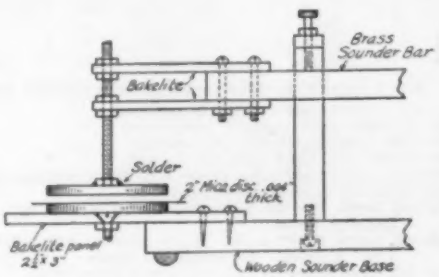
Keying the Amplifier

By A. G. Shafer*

A GREAT deal of material has been published in the past, regarding keying systems, so much so, that the subject would appear to be well nigh exhausted. Inasmuch as this article has to do with crystal-controlled transmitters in particular and oscillator-amplifier systems in general, it would seem to be "just another of those things". However the method to be described is really different from those previously expounded and the success has been so gratifying that it would be selfish, if nothing more, not to pass the information along. Whereas this method has been worked out for crystal transmitters it is also applicable to oscillator-amplifier systems without crystal control. In using it with straight oscillators the writer has had no great success. But more of that later.

Many of the articles on crystal transmitters have circuits showing the key placed in the high voltage lead of one of the intermediate amplifiers, or in some other position where a key-thump filter is a positive necessity. Now a key-thump filter is a highly effective piece of apparatus after it is once adjusted to the load it has to carry but let that particular load vary to an appreciable extent and the filter becomes a detriment rather than an aid to stopping the BCLs from sending a round-robin to the Radio Inspector. The load on an intermediate amplifier, while fairly constant during an extended period of transmission is subject to some variation during the time when things are warming up, to say nothing of the changes made by the operator himself.

To give an example of a representative case: At the Lansdowne Radio Association's station, 3BQJ, the radiating system consists of a vertical 30-foot antenna and a horizontal 30-foot counterpoise. Suspended from the same pole as the antenna is the aerial of a BCL receiver. The ends of the two antennas are about fifteen feet apart. (It should be explained here that the BCL is the owner of the club house and is not a transmitting amateur himself. Enough said!) The club transmitter is, briefly, a 250-watt amplifier fed from a cascade frequency-doubling system using three UX-210's and a 164-meter crystal, putting 41-meter power into the antenna. A diagram of the transmitter is shown, which with the data under it, is self-explanatory. The meters and the connections of the filaments are left out for the sake of clarity. It should be pointed out, however, that the filaments are heated by a.c. from center-tapped transformers and these center-taps are connected together, the negative high voltage and positive grid biasing voltage being also connected to these center-taps. Suitable by-pass condensers are also included in the filament circuits. Plate voltage is supplied by two high-voltage transformers. One has 750 volts each side of center-tap and the other has 1100 volts each side. These are connected to two chemical rectifiers. One consists of thirty jars and the other of forty-six jars. The output of these rectifiers is connected in series and the 500-volt supply for the intermediate amplifiers as well as the 350 volts for the oscillator tube is obtained thru resistances in series with the tap from the 750-volt output. Grid bias is obtained from a group of Diamond "B" Batteries. Various filters have been tried on the plate supply but the note obtained with the unfiltered d.c. is more satisfactory to copy.



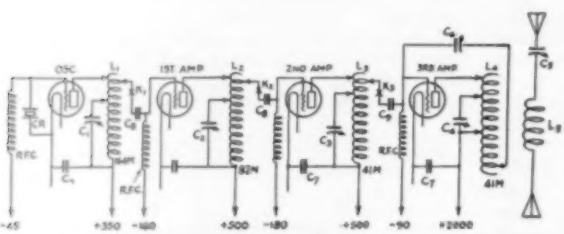
Every known system of keying (and a few unknown systems) was tried and the result was the same. The anvil chorus was in the BCL receiver. The condition was thought hopeless; until the writer recalled a conversation with Dr. Woodruff, the Atlantic Division Director, some time ago, concerning the keying system in use at one of the commercial stations. This consisted in raising and lowering the top plate of the crystal holder and was said to work beautifully. As can readily be seen this would require an extremely accurate job of machine work to limit the travel of the top plate so as not to hammer the crystal. The idea, however, seemed promising; for all that was needed was to vary the output of the crystal or one of the intermediate stages *without actually breaking any circuit.*

Previously, some work had been done by the writer in determining how small the feed

* President, Lansdowne Radio Association and operator of 3ACF, 4410 Bond Ave., Upper Darby, Pa.

condensers C_5 and C_6 could be in the various stages and it was found that for 80-meter work, 200μμfd. was sufficient while for 40-meter work 80 or 90μμfd. was plenty. A decrease in these values naturally resulted in a decrease in output. Why not key the transmitter by varying the capacity of one of these condensers in accordance with the well known "dots-and-dashes"?

Consequently, an old telegraph sounder was dissected and an insulated arm about three inches long was secured to the brass sounder bar making, in effect, an extended bar. As the drawing shows, this insulated arm is really two pieces of ⅛" bakelite 3/8" wide bolted one above and the other below the bar. To the outer end of this arm is secured a long screw which carries on its lower end a disc of aluminum or other metal. This disc is 1½" in diameter and the disc below it is the same size. This lower disc is fastened to the insulating base by a flat headed screw soldered to its under side in the center. On the top surface of the lower disc is glued or cemented a 2" disc of mica .004" thick. As may be seen, the two metal discs with the mica between will be pressed tightly together when the sounder windings are energized. The upward travel of the sounder bar is limited by the adjustment of the thumb screw shown on the right side of the drawing. The spring which is a part of the sounder is of course left on the sounder and has to be adjusted rather strongly to balance the weight of the added disc. It was not thought necessary to show the complete sounder as practically everyone knows what one looks like. Incidentally the capacity of this condenser-relay when depressed is about 400μμfd. and when in the "up" position is less than 25μμfd. At the first trial, the relay was connected between the grid of the 250-watter and the 2nd amplifier. This position is marked by K_3.[1] The set was adjusted with the relay down and when the key was operated, all trace of thump or click was removed not only from the BCL receiver but from a 40-meter receiver located about five feet from the transmitter. A blanketing effect was present in the BCL receiver on distant stations but this was removed by placing a 41-meter wave trap in the BCL antenna lead to his set. Of course the 40-meter club receiver is blanketed with the key depressed, but due to the absence of the terrific thump it is possible to work break-in without discomfort of any kind—an impossibility heretofore.



EXPLANATION OF SYMBOLS IN CIRCUIT DIAGRAM

C1, C2, C3—500 μμfd. variable condensers
C4, C5—200 μμfd. variable condensers
C6—125 μμfd. neutralizing condenser
C7—2000 μμfd. fixed mica condensers
C8—500 μμfd. fixed mica condensers (feed condensers)
C9—90 μμfd. fixed air feed condenser
L1—14 turns No. 22 Enameled Space wound ¼" apart on 3" Bakelite Form
L2—10 turns 1 32" x ¼" H. D. copper strip edgewise wound 3/16" spacing. C2 across six turns
L3—10 turns same as L2. C3 across three turns
L4—12 turns ¼" copper tubing 4" diameter spaced ¼" apart. C4 across five turns. Neutralizing portion about four turns
L5—Four turns same as L4
RFC—In Oscillator grid circuit three spider-web wound coils of forty turns each mounted in series aiding about ¾" apart on glass tube. Other RFC's are of 150 turns No. 24 D.C.C. on 1" dia. cardboard tube
CR—Crystal, 164 meters, and holder
OSC., 1st amp., and 2nd amp.—UX-210's. 3rd amp.—UV-204
The figures, such as 164 M, at the lower right side of the inductance refer to the wave to which the respective circuit is tuned

With the relay in this position a rise in plate current was experienced in the 2nd amplifier whenever the key was up which caused this tube to run unduly warm. The relay was then tried in the K_2 position where it functioned perfectly but with a rise in plate current in the 1st amplifier. Then the relay was placed in the K_1 position where it still worked quite nicely and where it caused no undesirable plate current variations. It will be seen that with the relay in this last position the effect, besides that of keying the set, is to vary the effective capacity across the inductance L. This naturally changes the tuning of the circuit L_2C_1 but with crystal control does not affect the frequency of the oscillator. The oscillator circuit is tuned with the relay depressed and it may be tuned to the very "peak" or position for maximum output and then when the key is released the tuning of this circuit automatically drops back to a point where the danger of the crystal stopping oscillation is less. This will be appreciated by those who have had experience with crystal transmitters.

As to the capacity-relay's application to

1. It is quite possible to key directly in these r. f. feeder lines. It may be of help to shunt the keying contacts with a small condenser (25 μμfds.) which should give a condition almost similar to the use of a "capacitive relay" as described above.
—Assist. Tech. Ed.

circuits other than crystal controlled it is apparent that it could be used with any oscillator-amplifier system provided it was not so placed as to vary the frequency of the oscillator itself. For then the whole purpose of that type of transmitter would be destroyed—that of a steady wave. This would limit it to positions K_2 or K_3. However, its use would more than repay the necessary small outlay of time and money. As to straight oscillators, it is possible that some system might be devised to control the output power without varying the frequency of the output. The writer would be glad to cooperate with anyone inclined to experiment further with this phase.

This system of keying is known hereabouts as the "Lansdowne Keying System" for it was here that it originated, inasmuch as its application to the oscillator-amplifier transmitter, crystal or otherwise, is concerned. It has solved the problem of "clickless-keying" for us and there is no reason for its not being applicable to any other similar transmitting system.

Acknowledgment is made for the invaluable assistance of G. W. Kimball of station 3BAL in making the tests in connection with the development of this keying device.

Strays

If your Balkite charger has been standing idle and refuses to perk properly, it can be brought back by connecting the 110 volt a.c. line in series with a lamp across each rectifier unit for a moment. The 110 breaks down the insulating film that has formed and the lamp prevents the whole power house from walking thru the jar.

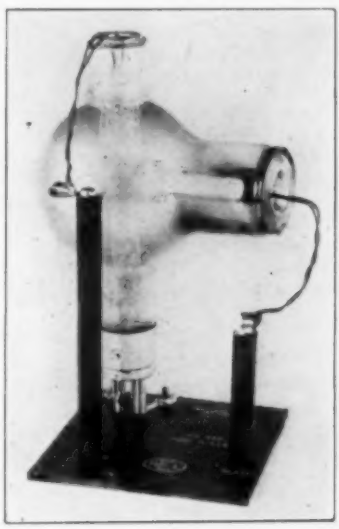
—·—·—

We note that the short waves are being "discovered" all over again by the broadcast folks. At any rate, the reports we have been seeing indicate that this is something "new".

NOW FOR 20 METER DX

The "852" Holder

WITH the advent of any new tube of unusual mechanical construction, there is always a period during which there are available no suitable manufactured mounts. Fortunately, this time is already past for the new UX-852. We are showing in the accompanying illustration,



a holder manufactured by the Radio Engineering Labs of New York City.

It consists of a square, hard rubber base having the two clips into which the filament prongs of the tube fit mounted directly upon it. These two prongs are farthest from the pin in the standard four prong base which adorns the lower arm of the tube.

The plate and grid leads are taken out of separate arms of the tube and this construction gives a tube of high insulation and low capacity. These plate and grid leads are slipped into Fahnstock clips that are screwed to the tops of two hard rubber posts. The length of these posts insures that the high insulation of the tubes will not be materially reduced due to the parallel resistance path and also that the capacity of this path will not be at all large in comparison to the tube capacity.

There is no reason why the plate and grid condensers should not be mounted directly to the clips at the top of the posts. This will help to keep them insulated from the other auxiliary equipment used.

—*H. P. W.*

A Constant Frequency Transmitter

By W. H. Hoffman *

PROBABLY the hardest problem with which the amateur and experimenter has to struggle in connection with low wave (or high frequency) transmission is that of maintaining his transmitter at a constant frequency as long as desired while still retaining the ability to shift rapidly to another (and equally steady) frequency. If, after choosing a suitable frequency, the transmitter will maintain this frequency to a high degree of accuracy, regardless of a swinging antenna, a vibrating building or a fluctuating power supply, then, a big step forward toward the ideal arrangement will have been made. None the less, one must be able to shift at times.

Where dozens of transmitters are placed into operation within given limits or bands as assigned to the amateur, it is often a decided advantage, where interference conditions exist, to be able to shift a transmitter from one definite frequency value to that of another value.

The crystal controlled transmitter seems to be the nearest approach to the ideal today. There is a tendency to overlook the fact that other oscillator arrangements are capable of maintaining frequency constant to a surprising degree of accuracy *if properly designed and assembled.* This paper will describe such a non-crystal device.

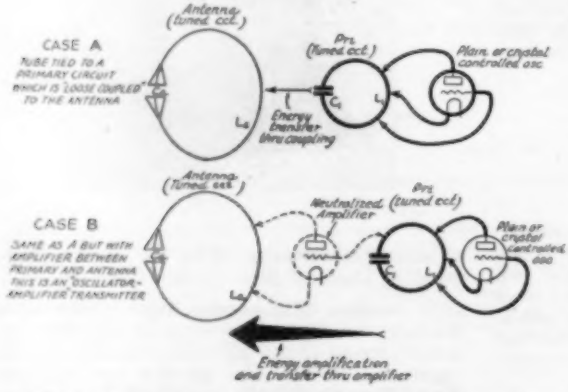


FIG 1. THE TYPES OF SENDING SETS USED TODAY

Case A represents most of the sets in use. Case B simply puts an amplifier between the primary and antenna circuits. One may look at the two sets as differing only because the case B set gets its coupling thru an amplifier. Such a coupling makes it possible to create a very steady signal.

* 9EK-9XH, C. F. Burgess Laboratories Inc., Madison, Wis.

THE TRANSMITTER DEVELOPMENT

Taking a birds-eye-view of tube transmitters, as they have entered the field, we see first, the tube oscillator which employs the capacity and the inductance of the antenna cricuit to form a portion of the oscillating circuit itself. We used to call such an arrangement "directly coupled." However, this sort of set is now obsolete and deserves no further mention.

In Figure 1A, we have a tube oscillator which has a tuned primary circuit L_1 C_1 made of coils and condensers, this circuit being "loosely coupled" to the antenna circuit. This is the way most of our stations are made today.

In Figure 1B, the tube oscillator has a tuned circuit L_1 C_1 of coils and condensers as in case "A" but the energy from this tuned circuit is put through a radio frequency amplifier before going to the antenna.

STEADYING THE OSCILLATOR

Ordinary oscillators shift frequency whenever there is a change in:

The load (this means a swinging antenna or feed line).

The plate voltage (change in line voltage or key surges).

The filament voltage (from keying or other causes).

Tube vibration also causes wabbles in the note.

It is necessary to build an oscillator which does not suffer from *any* of these effects. A crystal oscillator is generally considered to be the best. For the goverment and the commercial needs, this may be true, however, for experimental and amateur use, this type of transmitter has its disadvantages. Some of these are as follows.

(1) Cost.

(2) Does not allow of wave shift or QSY.

Our real problem then is to make a non-crystal-control oscillator which either does not suffer from the changes in load and voltage or else is protected from them.

THE NEUTRALIZED AMPLIFIER

To protect the oscillator from the changes of load caused by swinging antennas, etc., one may use the arrangement of Figure 1, case B. Here we come rather

close to having a "one-way" coupling, which allows power to flow through to the antenna but does not allow antenna changes to work back and change the capacity and inductance of the amplifier plate circuit.

In this type of amplifier the coupling between the input and output circuits due to the capacity between the elements of the tube, is neutralized or balanced out. This is important for it prevents the amplifier from oscillating and it reduces "back coupling" between the antenna circuit and the oscillator circuit to a value that approaches zero. The exact circuit used for the neutralizing does not matter, though ordinarily it is convenient to use an arrangement akin to the Rice or Hazeltine systems.

The neutralized amplifier, fortunately, retains all its advantages when used following oscillators of the usual form, such as the Hartley or the Colpitts, as well as when used following the crystal oscillator.

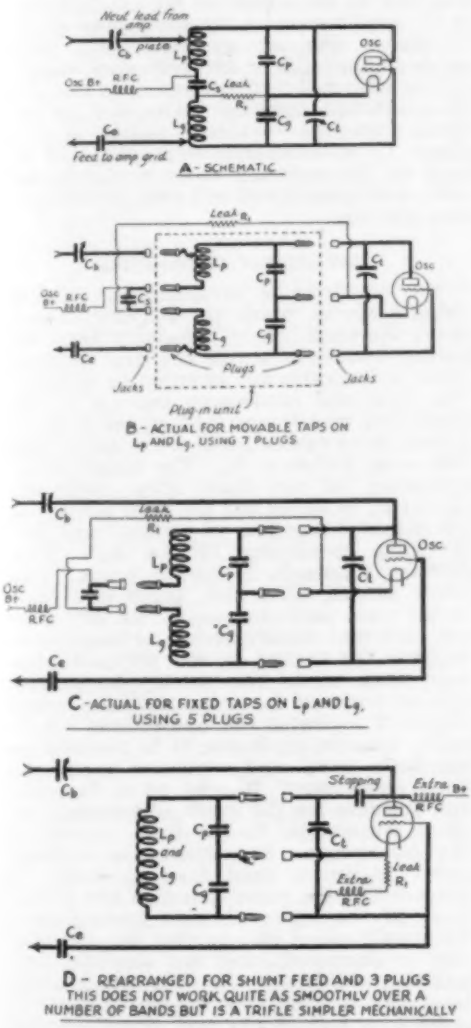
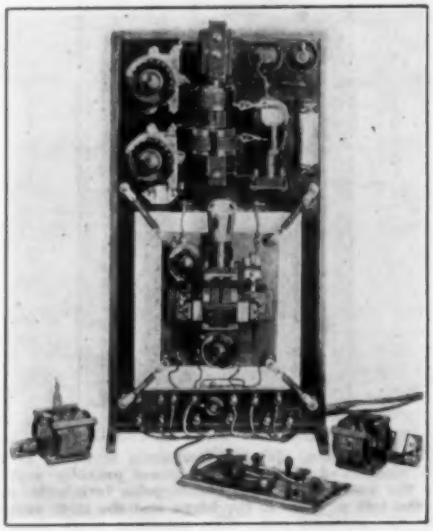


FIG. 2. WIRING DIAGRAMS OF THE PLUG-IN TUNED CIRCUITS

Diagram C is the one used in the present set. The heavy lines show the circuits carrying r.f. Some of these carry both r.f. and d.c., others carry r.f. only. The thin lines show circuits carrying d.c. only.



FRONT VIEW OF THE TRANSMITTER

The upper wooden panel carries the amplifier, and the spring-suspended rubber panel carries the oscillator. Nothing is mounted on the rear of the panel except a plate choke on the back of the oscillator panel.

The lower small panel is a terminal strip and also supports a filament rheostat for the oscillator tube. The power supply leads are cabled together.

The coils in position are those for the 40-meter band. Those shown at either side of the transmitter are for the 80-meter band. The 20-meter coils are not shown.

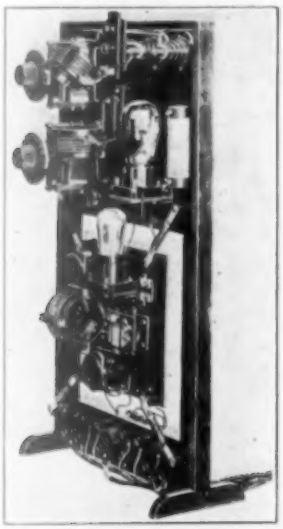
THE OSCILLATOR

In order to approximate the stable frequency characteristics of the crystal controlled transmitter it is imperative first to produce a *stable oscillator*. Although not matching the frequency constancy of a crystal oscillator, it can be shown that the ordinary form of tube oscillator can, when connected in a proper arrangement, with suitable constants, be depended upon to maintain a constancy of frequency that is surprising and remarkable.

Some of the conditions that are desir-

able for obtaining oscillator stability are as follows:—

(1) Battery supply for source of plate and filament energy. Although uni-directional current may be obtained from rec-



SIDE VIEW OF THE TRANSMITTER

Two porcelain, standoff insulators mounted at the top right-hand corner of the panel provides support for the antenna and the counterpoise terminals. Just to the left of them is the hinge and the slide support for the antenna coil. The amplifier plate choke is mounted beside the amplifier tube. The upper variable condenser tunes the antenna circuit while the one just below it provides tuning for the amplifier plate circuit. Of the two variable condensers on the suspended panel, the upper one is the neutralizing condenser and the lower one is the vernier tuning condenser.

tified a.c. and from a d.c. generator, it is found to be difficult to remove all of the ripple even with elaborate filter systems, when such sources are used to supply an oscillator at frequencies greater than 3000 kilocycles. Battery supply will give d.c. note characteristics that are difficult to obtain from any other source.

(2) The tube should not be "forced" or worked at an overload. The working of a tube so that its plate shows a difference in heating when the load is thrown on and off causes changes in the tubes characteristics such as will give unstable action.

(3) An oscillator circuit arrangement which includes relatively large capacities across the elements of the tube especially from the grid to the filament has been found desirable for obtaining stability.

(4) A high value of grid leak resistance has been found effective in reducing frequency changes caused by changes in plate and filament voltage supplies to a tube, working as an oscillator.

A TRANSMITTER WITH BATTERY DRIVEN OSCILLATOR

The transmitter described in the following paragraphs is one of low power. It is designed to use a tube of the UX-210 type as an amplifier and a receiving tube of the UX-201-A type as an oscillator[1]. Such an oscillator with a 180-volt plate supply will furnish sufficient excitation to the grid of a UX-210 amplifier tube and as the drain from the oscillator source is only about 15 milliamperes, dry cells such as used on the ordinary radio receivers, are quite satisfactory and will give service over long periods.

THE SPECIAL OSCILLATOR

The oscillator is arranged in a series Colpitts circuit which automatically brings about the condition of relatively large capacities connected across the tube elements which is favorable for maintaining stability. The coils and condensers making up the circuit are closely grouped on the front of a small hard-rubber panel eight inches high and seven inches wide. The tuned circuit consisting of two fixed mica condensers C_p and C_g in series and the split coil L_p -L_g are mounted together on a small hard rubber strip measuring 1¾" by 5¾". Connections terminate in spring plugs. This tuned circuit, as a unit, plugs into jacks on the main oscillator panel. In this manner, different condenser-coil arrangements, suitable for tuning at the different amateur wave bands, can quickly be plugged into or removed from the oscillator panel. Figure 2 indicates the connections. A 50 μμfd. variable condenser C is mounted on the main panel and connected across the fixed condensers. It acts as a "vernier" and provides for the exact adjustment to a given wavelength in the band covered by that coil system. In addition, the oscillator panel carries a fixed feed condenser C_f connected to the center panel of the inductance of the series Colpitts arrangement. This main panel also carries the amplifier feed condenser C_f and the amplifier neutralizing condenser C_b. The whole oscillator unit is hung from spring supports in order to absorb shocks and vibrations that would otherwise affect the stability. Connections to the unit are made by means of flexible leads.

THE AMPLIFIER

The amplifier grid or input circuit is supplied from the oscillator circuit. The amplifier is mounted on a hard wood panel which forms the upper part of the frame that supports the oscillator unit. The plate

1. A UX-171 may be used here. It will have a longer life and give greater output but will require more plate current which will reduce the life of the plate battery.—Asst. Tech. Ed.

inductance L_b is arranged for plug-in coils suitable for tuning over the desired wave bands. The plate tuning condenser C_a is of the variable air (receiving) type with a maximum capacity of 500 μμfds. The plate supply to the amplifier may be either a.c. or d.c. from any source that is desired.

The amplifier is of the neutralized type. Its grid is furnished with radio frequency excitation from the grid side of the tuned oscillator circuit. From the plate side of the same tuned oscillator circuit, a connection is run to a small variable air condenser C_b to the plate of the amplifier tube. In respect to the tube filaments, the grid and plate sides of the tuned oscillator circuit are of opposite phase. It is therefore possible, by proper adjustment of the small variable condenser C_b, to neutralize the capacity coupling between the tuned oscillator circuit and the tuned plate circuit of the amplifier. Without some form of neutralization these circuits will be coupled through the internal capacity of the amplifier tube. The arrangement will be recognized as Rice neutralization adapted to a balanced Colpitts input circuit. Fortunately, this neutralization of coupling also works in the reverse direction so that changes in the amplifier plate circuit such as may be caused by a swinging antenna or other regions have little effect upon the oscillator.

KEYING

The method of keying which is used effectively cuts off the plate supply to each of the tubes when the key is up. The oscillator is keyed in the negative high voltage lead. The amplifier grid circuit is arranged in a manner such that the amplifier grid receives a high negative bias when the key is up. This high negative bias is due to the fact that the oscillator "B" battery functions as additional "C" battery for the amplifier tube when the key is up. The circuit extends from the amplifier grid through the amplifier "C" battery, through the oscillator "B" battery, to the oscillator plate. From the oscillator plate to the filaments of the tubes there is a conducting path due to the electron emission in the oscillator tube. The combined batteries therefore function to place a high negative charge on the amplifier grid when the key is up.

ADJUSTMENT

To tune the transmitter, put both tubes in place and make connections to the terminals as designated, *except* the "plus 400" to the plate of the amplifier tube. Place both the oscillator and amplifier coils for the desired wave band in position. With the "plus 400" lead to the amplifier open, light the tube filament and close the key. The oscillator should operate immediately. Adjust the variable condenser C+ until the desired wavelength is obtained. Then, set the variable neutralizing condenser C_b on maximum and proceed to neutralize the amplifier in the following manner. Obtain a small flashlight bulb of about 2.5-volt

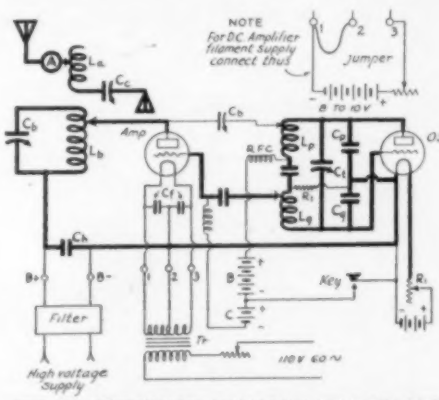
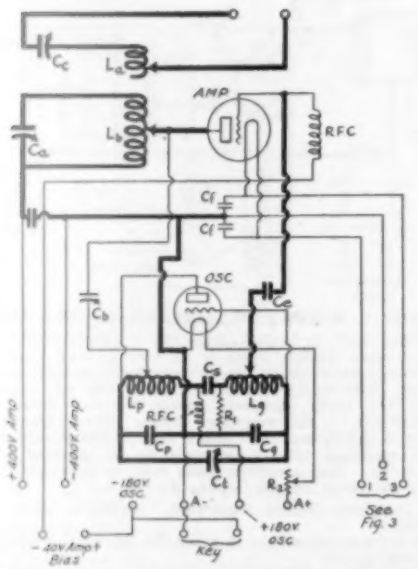


FIG. 3. SCHEMATIC DIAGRAM OF THE SET

Note that the tuning capacities of the oscillator are very much higher than is customary and that the coils are quite small; the purpose being to gain steadiness. The heavy leads are the tuned r.f. circuits and the leads carrying power forward from the osscillator to the amplifier input. The neutralizing lead is not shown as a heavy line to avoid confusion. The oscillator tube is intended to be operated from batteries. The amplifier tube may be operated from any source of supply, either d.c. or a.c.

Cc Antenna tuning condenser (receiving type) 500 μμfd.
La Antenna coupling. 6 turns No. 12 wire, 2-⅞" dia. spaced 5/32".
Cb Amplifier plate tuning condenser (receiving type) 500 μμfd.
Amn. Amplifier tube, CX-310.
RFC Radio frequency chokes. 300 turns No. 30 d.c.c. on one inch rod or tube.
Cf Filament by-pass condensers (mica receiving type) 6,000 μμfd.
Ch Amplifier high-voltage by-pass condenser (mica receiving type) 0.02 μfd.
Cb Neutralizing condenser. (General Radio vernier type.) 50 μμfd. max.
Cc Grid feed condenser, (mica receiving type) 100 μμfd.
Osc Oscillator tube. UX-201-A.
B1 Grid Leak, 20,000 ohms.
Cp Cg Fixed Mica tuning condensers across oscillator coils.
For 80-meters—500 μμfd. each
For 40-meters—250 μμfd. each
For 20-meters—100 μμfd. each
Ct Oscillator tuning condenser, same as Cb
R2 Filament rheostat, 10 ohms.
Cs Fixed Mica condenser, 5000 μμfds.
Oscillator and amplifier inductance coils are wound from No. 12 bare copper wire, 2-⅞" diameter, turns spaced 5/32" center to center.
Lp & Lg for 80-meters, 5 turns each, coils spaced 5 16" apart.
Lp & Lg for 40-meters, 3 turns each, coils spaced 5/16" apart.
Lp & Lg for 20-meters, 2 turns each, coils spaced 1 " apart.
Lb for 80-meters, 11 turns
Lb for 40-meters, 5 turns
Lb for 20-meters, 3 turns
The same antenna coil is used for all wavebands, a clip being provided for the changing of the number of turns. A hinge and slide arrangement allow coupling to be varied.

rating. Form a single turn of fairly heavy wire about the same diameter as the amplifier plate coil. Connect the two ends of the single turn to the two terminals of the flashlight bulb. This may be done by using a miniature socket or by soldering directly to the bulb. Couple the single turn closely to the top of the amplifier plate coil. (Keep



THE "UNSCRAMBLED" SCHEMATIC DIAGRAM IS SHOWN IN FIG. 3. THE HEAVY LINES SHOW THE R.F. CIRCUITS

Although voltages are marked on some of the terminals these may be changed, especially if a different tube combination is used.

the "plus 400" amplifier plate supply lead open.) With the key closed, turn the amplifier plate tuning condenser C_a until the flashlight bulb lights. Then, adjust the condenser C_b until the bulb goes out. Slight readjustment of C_a may be necessary due to slight detuning when C_b is changed. The proper adjustment has been found when the lamps stays dark while C_a is turned *slowly* across the resonance point, meaning resonance between this circuit and the oscillator. The amplifier tube is now neutralized. The "plus 400" lead may now be connected and the *amplifier* plate tap adjusted for best output. In the transmitter shown it was found that variable taps on the oscillator coils L_p and L_g were not necessary. The taps were permanently connected to the outside ends of the oscillator inductance. (See Figure 2.) The antenna circuit is tuned to resonance in the usual manner, the exact way of going about this naturally depending on the method of feeding the antenna.

The set can be used in any of the standard arrangements operating any sort of an antenna on either its fundamental or a harmonic and feeding either by a "current feed" or a "voltage feed" method. Naturally also, a one-or two-wire feed line may be used if desirable or convenient.

Official Wavelength Stations

THE Official Wavelength System furnishes a service coöperative with, but differing from, that of the Standard Frequency Stations 9XL and 1XM, which are also operated in accordance with plans made with the O.W.L.S. Committee. Contact with the O.W.L.S. is through Mr. D. C. Wallace, 6AM, who is also chairman of the committee. Mr. Wallace is at present checking up all O.W.L.S. to make sure that they are really indicating their wavelength (or frequency) at the end of each transmission—and are doing so with proper accuracy; which is to say 2%. They do this in the course of regular operation and do not send calibration schedules as do the S.F. stations.

The list is as follows:

1AAC, 1AVW, 1AWW, 1BHW, 1BZQ, 1CCW, 1CK, 1KP-NRRC, 1ZL, 1ZO, 2CLA, 2DS, 2MU, 2SZ, 2XI, 3APV, 3BE, 3XW, 4LK, 5AGN, 5AKN, 5EW, 5MN, 5OX, 5PH, 5SP, 5XBH, 5ZAV, 6AKW, 6AM, 6BB, 6BCP, 6BGM, 6BQB, 6CAE, 6CDN, 6CDY, 6CVO, 6LJ, 6SX, 6TI, 6TS, 6XAG, 6XAO, 6ZE, 6ZZH, 6ZV, 7AGI, 7BE, 7BU, 7CQ, 7NX, 7QK, 7XF, 7ZX, 8AA, 8APZ, 8BAU, 8BZT, 8EQ, 8GU, 8GZ, 8XC, 8ZG, 9AXQ, 9BCH, 9BGK, 9BMR, 9CPM, 9CXU, 9DXN, 9EGU, 9ELB, 9FF, 9IG, 9WI, nc1AE, nc2BE, nc3CO, nc3NI, nc3FC, nc4BT, nc4FV, nc9AL, eg2OD, eg2SE, Ireland 5NJ, oa2CM and oz2AC. Crystal Controlled O.W.L.S.; NKF, 1AXA, 2BO, 2BRB, 2EF, 2WC, 4BY, 4XE, 6AOI, 6DLL, 8CMM, 8DAJ, 9AUG, 9BVH, 9UZ-NRRL, 9ZA, eg2NM, eg5LF and oa5BG.

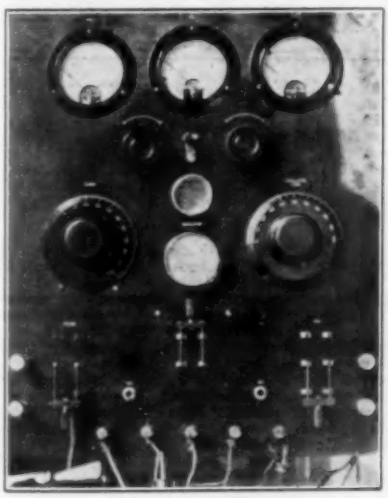
Standard Frequency Stations: 1XM and 9XL.

Another View on Crystal Control

THERE have been many arguments here of late as to the possibility of crystal controlling a quarter-kilowatt tube by puting a UX-210 ahead of it and operating the grid of the 210 under crystal control. The question is, "If the quarter-kilowatt tube operates at full power is it under crystal control, or is it practically self-oscillating?"

It seems possible that one might have the amplifier highly regenerative and yet to have it under some degree of control though probably not as perfectly so as when its grid power is all supplied by the crystal oscillator. Under these circumstances it would be a trifle more easy for the tube to operate at the crystal frequency since there the normal regeneration in the amplifier would be assisted by the power from the crystal oscillator.

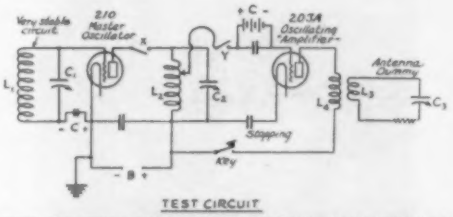
Although a crystal oscillator was not available, a test of this notion was made with a plain oscillator constructed with



THE OSCILLATING AMPLIFIER SET AT 5AJJ

The circuit arrangement is similar to that of the diagram. A switching system permits insertion of various degrees of filtration so that the stabilizing effect of the master oscillator can be noted.

high capacity, low inductance and so adjusted as to secure stability of frequency. The amplifier was connected to an artificial antenna variably coupled to the amplifier, this coupling being varied during test transmission. The amplifier was not neutralized and could be made to oscillate. The circuit arrangement was that shown in the diagram and it can be seen that by disconnecting at X the amplifier could be made into an Armstrong circuit oscillator while disconnecting at Y would leave the oscillator alone operatting in the same circuit.



TEST CIRCUIT

TEST CIRCUIT TO TRY POSSIBILITY OF STEADYING AN UNSTABLE OSCILLATOR BY SUPPLYING A PART OF THE GRID ENERGY FROM A VERY STABLE OSCILLATOR

C1 is comparatively large while C2 and C3 are comparatively small. Circuit L1-C1 is comparatively stable and the other two circuits are the reverse. In a crystal control set the crystal would take the plate of L1 and C1.

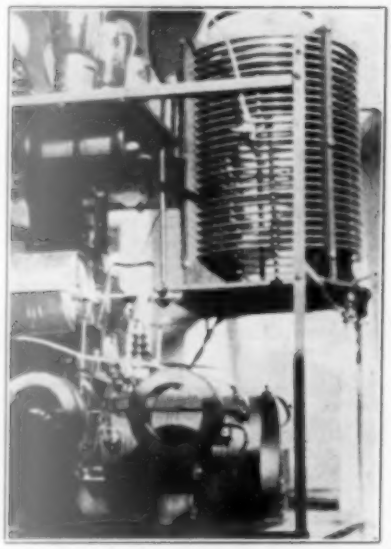
The test was made as follows. Using a low capacity and fairly high inductance in the antenna dummy and with the circuit broken at X we have a sort of Armstrong oscillator as mentioned before. It is not very steady and when the key is operated the wave jumps around rather badly, also changes in the antenna coupling or tuning change the wave badly.

The circuit at X is now closed so that the oscillator goes to work. By adjustment of the condenser C_1 the oscillator is put on the same wave as that on which the "amplifier" previously operated. Because part of the grid power of the amplifier is now supplied from the oscillator the output is increased somewhat and because the frequency is now partly under control of the very stiff circuit L_1-C_1 the steadiness is improved. Keying does not make the wave jump around nearly as badly.

The test was rather hasty and of course one may argue that the circuit L_2-C_2 changes its function somewhat when both switches are closed but the whole thing will be found to have a good resemblance to the usual crystal circuits with amplifiers and creates at least a suspicion that some of the crystal control stations above referred to operate in this fashion.

The photographs herewith show a station of several years ago (5AJJ) as it was then operated by Mr. Bernard S. Shields at 3704 Oak Lawn Ave., Dallas, Texas. The circuit used resembled very closely the test circuits described above and it is important to note that at the lowest wavelength setting used there was still being employed

half of the capacity of the rather large variable condenser nearest the reader in the rear view of the set. This was the condenser in the oscillator circuit and other dimensions show it to have been a very



THE WORKING PARTS OF THE SET AT 5AJJ

Note particularly the large condenser at the left center. This is the tuning capacity of the master oscillator.

stable and stiff circuit. The arrangement was operated for several years and Mr. Shields says of it, "The amplifier circuit is a reversed 'feedback' (tuned grid with untuned plate closely coupled to the antenna as in the test circuit) with 45-watt tubes in parallel but added to this is a master oscillator. The grid to the oscillator inductance is first disconnected while the amplifier circuit is being tuned. (This is the oscillating amplifier of the diagram.) The oscillator is then put on the same wavelength by using the variable condenser across the inductance and there is an increase in antenna current also the wave emitted becomes very steady."

—*R. S. K.*

Standard Frequency Transmission

THE Official Wavelength Station Committee of the Experimenters' Section, A.R.R.L. announces the following standard frequency schedules. The frequency values at 1XM and 9XL are based on the standards of the Bureau of Standards and have been checked by the Cruft Laboratory at Harvard University and by the Communications Laboratory of the Massachusetts Institute of Technology. While an accuracy of 1/10 of 1% is to be expected, no guarantee is made. Station 1XM has suspended for the summer. Details on 30th 1XM and 9XL may be found on page 8 of the June issue.

In the following, "*f*" is the frequency in MEGACYCLES and the *approximate* wavelength in meters follows.

SCHEDULES

(Figures are frequencies in MEGACYCLES per sec.; approx. wavelengths in parentheses.)

Friday Evening Schedules					Sunday Afternoon Schedules		
Eastern Standard Time for 1XM					Eastern Standard Time for 1XM		
Central Standard Time for 9XL					Central Standard Time for 9XL		
Time (PM)	Schedule A		Schedule B		Time (PM)	Schedule C	
	f	λ	*f*	λ		*f*	λ
8:30	3.50	(85.7)	6.50	(46.1)	3:00	10.0	(30.0)
8:42	3.60	(83.3)	6.75	(44.4)	3:12	12.0	(25.0)
8:54	3.75	(80.0)	7.00	(42.8)	3:24	14.0	(21.4)
9:06	3.90	(76.9)	7.25	(41.3)	3:36	14.5	(20.7)
9:18	4.00	(75.0)	7.50	(40.0)	3:48	15.0	(20.0)
9:30	5.70	(52.6)	7.75	(38.7)	4:00	15.5	(19.3)
9:42	6.50	(46.1)	8.00	(37.5)	4:12	16.0	(18.7)
9:54	7.00	(42.8)	8.25	(36.3)	4:24	18.0	(16.7)
10:06	7.50	(40.0)	8.50	(35.3)	4:36	20.0	(15.0)
10:18	8.00	(37.5)	8.75	(34.3)			
10:30	8.50	(35.3)	9.00	(33.3)			

July 1,	A	9XL
July 10,	C	9XL
July 15,	B	9XL
July 29,	A	9XL
August 5,	B	9XL
August 14,	C	9XL
August 19,	A	9XL

The August schedules are subject to change. See August *QST*.

DIVISION OF TIME

3 minutes—QST QST QST nu (Station call letters)

3 minutes—5 sec. dashes broken by station call letters every half minute.

1 minute—announcement of frequency in megacycles per second (8.75 megacycles per sec. is sent as "8 r 75 MC.")

1 minute—announcement of next frequency in megacycles per second.

Special Notice—The continuation and possible extension of these transmissions depends entirely upon the response of the A.R.R.L. If you use the transmissions send a note to Experimenters' Section, A.R.R.L., Hartford, Conn.

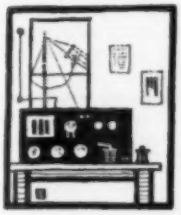
—*R. S. K.*

Strays

Taken from the log of 1ARE on contact with 4CK.

Getting contact	2	minutes
His report my sigs	4	"
My report his sigs	4	"
His wx report (very complete)	10	"
My wx report (very complete)	10	"
Description of his YL	9	"
Description of my OW	1	"
Change to Daylight Saving Time	60	"

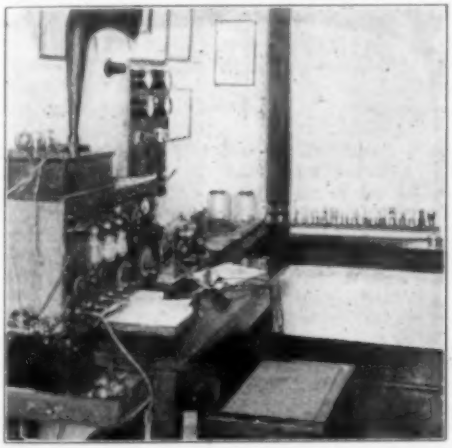
3LD asks, "If a man interested in baseball is called a baseball fan, can a student of electricity be called an electric fan?"



Amateur Radio Stations

3ZI, Trenton, N. J.

IN the pre-license days, Edward G. Raser was bitten by the amateur radio bug and almost immediately put up what was then a high class outfit. This consisted of



a crystal detector and spark-coil transmitter. Later, when licenses became necessary adjuncts to a station, one was obtained and the call of 3NG was assigned. In spite of the obvious interpretation that could be made of the call, the station prospered right through until the war, at which time it was dismantled.

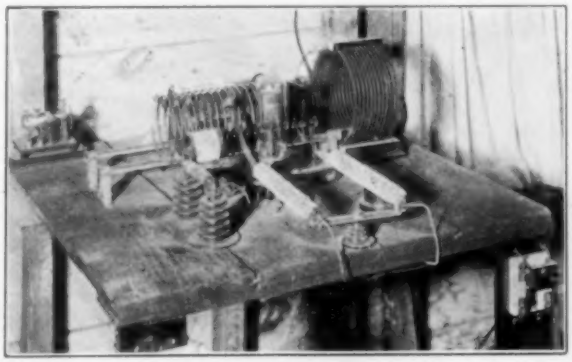
After getting out of the Navy, at the close of the war, a new station was put in operation drawing the call of 3CS. The rock-crusher then employed did its stuff until the spark died a natural death. In 1922 when the phone craze sprang up, a phone was put in but did not hold its own for very long. In 1923, the present call of 3ZI was assigned and the station completely remodeled. Various changes have been made since then.

The transmitter proper is located in the attic and is remotely controlled from the operating room. It is built up bread-board fashion and uses a Western Electric 211-A. fifty watter in a Hartley circuit. The tube used is four years old which speaks well for the care taken in the adjustment of the circuit. It is always run with a conservative input.

The plate supply is taken care of by an Acme 500-watt transformer, the output of which is rectified by a pair of "S" tubes. These have never been overloaded or otherwise abused and have been in operation for five years. No attempt is made to filter the plate supply, as a good r.a.c. note is considered to be the most practical for handling traffic. The filament is supplied from a separate transformer.

The power supply units are located in the operating room and are wired up through a panel with all the necessary meters so that the operator can see at a glance just what is happening in the circuits. All the controls for varying the plate and filament voltages are on this panel and within reach of the operator. The power supply is fed to the transmitter thru BX cable which runs from the operating room thru the ceiling to the attic. Radio frequency chokes are inserted in all these leads.

The antenna is a single wire, 60 feet long,



rising semi-vertically from the house top to the 48 foot "rain spout" mast. A three foot cone top serves to put the capacity

where it belongs and helps to steady the wave here. The counterpoise is similar and comes within five feet of the earth. The insulators are of plate glass cut from old windshields. A separate antenna is used for reception which allows the use of break-in. This receiving antenna is 200 feet long but only 20 feet high.

The short-wave receiver is located below the power panel and covers a range of from 20 to 110 meters. A 600-meter receiver stands next to the short-wave job and is used for the sole purpose of standing by for "SOS" calls when the BC stations shut down, and for listening to the ship-to-shore traffic now and then as fancy calls.

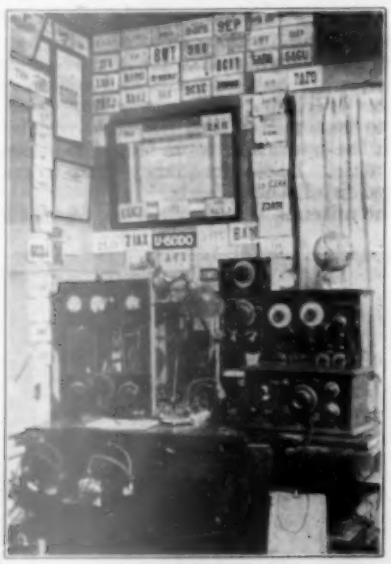
Mr. Raser has been a member of the League since its inception in 1915 and has held a First Grade Commercial License since 1914. He has been in the Navy and has operated aboard several ships. 3ZI is one of the original ORS appointed and still holds that title. RM and OO appointments are also held as well as being the Alternate Net Control Station for N. J. in the Army-Amateur scheme of things. Various other appointments have been held in the past.

Mrs. Raser is also a licensed operator and holds an Amateur First Class License and has had assigned to her the call letters of 3AEC. She is not now on the air as a Junior op takes most of her time. As Edward Jr. is very much interested in radio, it makes a complete radio family.

6DDO, Los Angeles, Cal.

THIS station is located at 200 West 42nd Place, Los Angeles, California. It is owned and operated by H. G. Pearce.

When 6DDO was first built, it started like a good many others by installing a receiving tube and shoving about 500 volts on its plate. This was soon discarded for the five



watter and later a 7½ watter. Four of these went West due to overloading and after getting acquainted with the short waves, a 203 was put in. After blowing up several of the receiving condensers, better insulated ones were substituted. At the present time, a 203-A is being used.

The plate voltage is obtained from an Acme 1100-volt transformer, rectified by a soup rectifier consisting of 32 pint jars. The elements have about four square inches of active area in the borax solution. White oil is kept on the solution which is changed every two months or so. It requires practically no attention. The filter consists of a six-henry choke which is capable of passing 150 mils. A two-mike condenser is shunted across the line each side of the choke. The output amounts to about 900 volts which allows the tube to be run cold. This helps to keep a steady note which does not climb. Reports are always "good, steady d.c."

The present transmitter uses a loose-coupled Hartley circuit. The cabinet is closed in and the window through which the tube may be seen is covered with a piece of quarter-inch plate glass. The coils are edgewise-wound copper ribbon, 5 inches in diameter. Six turns are used in the secondary and seven in the primary. They are suspended from the top of the frame and are held by three glass rods. The lower rod is fastened to the base by rubber bands and prevents any excessive vibration.

The plate condenser has a capacity of 2000 μμfd. The grid one is of 900 μμfds. Both are rated at 3,000 volts. The grid leak is 5,000 ohms. The antenna series condenser has a 500-μμfd. capacity and the primary one is 120 μμfds. Keying is done by means of a relay in the center tap lead and it is controlled by either a straight key or Vibroplex. The Vibroplex is slowed down. A 1-μfd. condenser is in series with

a 30-ohm resistor and placed across the key to keep down the sparking. A green pilot light indicates when the 110-volt line to the set is alive and a red one tells when the set is in an operating condition.

The receiver is of the "Schnell" type and after being rebuilt five times is the equal of anything that has been tried so far. The secondary condenser is about 100 μμfds. and the throttle condenser about 350 μμfds. The antenna condenser consists of two 2¾" round plates, one of which is fastened to a screw which allows the capacity to be adjusted by means of a long bakelite rod reaching outside of the panel. There is also a two-plate midget condenser shunted across the tuning one and used as a vernier. It is excellent to hold weak signals without disturbing the main tuning condenser. The coils are of the Lorenz-type, wound three inches in diameter of 14 d.c.c. wire. They are held in place by four binding posts mounted on a piece of bakelite which is fastened to the base on two stand-off insulators. A 112 with 22 volts on the plate is used as detector and a 201-A is used as an audio amplifier tube. A 10-to-1 transformer is the coupling device. It has been found that by turning down the filaments, the local and near DX signals seem to be weaker but the long DX pounds in fully as strong as with them turned up full. The advantage of this is that the usual noise is muchly diminished.

The antenna is 33 feet long and is a vertical wire with a cage top and the counterpoise is a single wire 26 feet long. Its fundamental is about 42 meters.

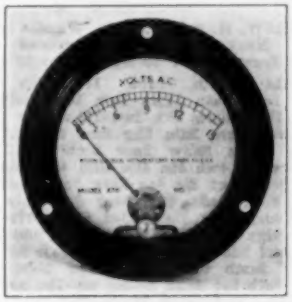
Excellent work has been done and most of the U. S. has been worked as well as Honolulu, Philippines, Australia, Tasmania, New Zealand, Japan, Canada, Argentina, Mexico, Chile, Singapore, Borneo, Tahiti and ships in three oceans. 6DDO is an Official Relay Station and handles approximately 60 or 70 messages per month. All traffic is cleared within 12 hours when possible. Traffic is not the only aim as experimenting and rag-chewing is just as popular.

An A.C. Voltmeter

THE Weston Electrical Instrument Corporation of Newark, N. J., have just announced a new series of alternating current meters. These may be obtained in various ranges as either milliammeters, ammeters or voltmeters.

The movement is of the iron-vane type and is enclosed in a fan-shaped bakelite housing. This prevents dust from working into the movement and protects it from any mechanical injury. The housing can be seen in the illustration showing the inside of the case. This part of the instrument carries all the moving parts. The other section has mounted upon it the actuating coil, the multiplier and terminals. As will be noted, the actuating coil is shaped so that it will fit closely over the housing in which the vane is mounted.

This meter has the same face dimensions as the Model 301 meters and therefore, fills



a gap in the line of small switch-board instruments commonly used in radio work. It is slightly deeper than the 301 instruments and measures 1⅝" from the back of the flange to the back of the meter. The terminals extend a bit beyond this. This should not be particularly damaging as the average transmitter has plenty of space directly behind the meters.

The instrument shown in the cut is the 0-to 15-volt one. It is possible to get good readings as far down as three volts which

makes it useful for all of our common transmitting tubes as well as for receiving tubes when they are run from a.c. However, this is not the only range that may be had as there are several; one of which should fit your case. They may also be obtained in a variety of ranges as ammeters and milliammeters.

—*H. P. W.*

A SWELL DREAM

Calls Heard

eg-2BZW, H. E. Smith, 31, Wandle Road, Hackbridge, Surrey, England
(Heard from Apr. 1 to Apr. 10 to 20 meters)

1alf 1abt 1bhm 1aba 1ro 1ka 1ry 1zz 1ac 1adm 1aur 1asu 1ajm 1uw 1bvl 1cdp 1pm 1vc 1cfo 1byu 1bux 1caw 1kk 1sw 1bhs 1akz 2anm 2aqw 2jn 2fc 2wc 2ahm 2aiu 2bg 2mu 2ie 2qf 2bsl 2aer 2bur 3ads 3avm 3akw 3mv 3cch 3bwt 3ag 3aks 3mw 4bl 4tv 4jr 4wh 4tn 4lm 4dm 4ok 5acl 5agq 5ajs 6hb 8boy 8csr 8bct 8ic 8oq 8arg 8afq 8cdv 8qh 8anc 8axa 8xe 8box 8cdb 8gk 8aul 8cil 8aly 8dhx 8ex 8ahc 8baj 8drj 8dkx 8bdp 8ded 8bau 8cfr 8acy 8auh 8cvo 8clp 8dgx 8djv 8asb 9awb 9dga 9db 9drd 9bmx 9aib 9cn 9arl 9dbw 9lb 9kv 9bpm 9aji 9es 9ara 9cca 9anz 9dbv 9emb 9aol 9cne 9agq 9bht 9edy 9dkc 9dkk 9cip 9afb 9ef 9axb nc-1oj nc--1bo nc-1co nc-1dq nc-2ax nc-2be nc-3mp nc-3fc nc-4cn.

eg-2HJ, K. E. B. Jay, 19 Elm Close, Amersham, Bucks, England

1aal 1aao 1abz 1ach 1aci 1adl 1adm 1aer 1afy 1aha 1air 1ajf 1ajg 1akm 1alr 1aoh 1arv 1asa 1asy 1aub 1auc 1avf 1avl 1awe 1axa 1axx 1bbc 1bdm 1bez 1bhi 1bhs 1bms 1boe 1bol 1bym 1bz 1chr 1cjs 1cmx 1cpb 1cra 1cue 1ex 1dee 1di 1dl 1fn 1ga 1gp 1he 1hj 1is 1jy 1ka 1kk 1mv on 1ql 1qv 1rd 1rf 1rn 1ro 1rp 1rx 1us 1vc 1woj 1xaw 1xm 1xj 1zd 1zw 2aby 2afv 2agn 2ags 2ahe 2ahf 2ahv 2alb 2ama 2amc 2amf 2amj 2amp 2apq 2aqw 2arr 2atk 2atu 2atv 2avg 2avk 1avw 2awu 2ayj 2azb 2blm 2bzj 2bud 2buy 2cdm 2cds 2cep 2cs 2csn 2cst 2cuq 2cvj 2cva 2cxd 2cyq 2dc 2dg 2fc 2iz 2kr 2kx 2le 2ma 2nm 2ox 2pv 2qf 2qh 2sz 2to 2tp 2ym 3abr 3acm 3afw 3agu 3ajx 3any 3auv 3av 3ay 3ba 3bhp 3bn 3bqj 3bva 3cbl 3cds 3cdv 3cjn 3ckj 3cp 3fi 3gp 3jm 3jo 3jt 3la 3ld 3lq 3ow 3pf 3qw 3sh 3ut 3su 3wj 3wm 3adl 3bco 3bgg 3bqa 3cbv 3cch 3hu 3ku 3qp 3qu 3sj 3tn 3wc 3wf 4ce 4db 4fu 4io 4oc 4oy 4ab 4ak 4cu 4cv 4fa 4hl 4iz 4jm 4ll 4nn 4ob 4pk 4rp 4ry 4sp 4st 4ta 5aeb 5jf 5jy 5kc 5oa 5qj 5ql 5rh 5rr 5vv 5hz 5ajs 5aky 5df 5fd 5ki 5rr 5va 5vu 5zav 6bjl 6hm 6nw 6ta 6am 6amm 6dp 7df 7go 7ek 7vq 8adg 8aef 8afq 8aj 8ajk 8arg 8auc 8aya 8ayf 8baj 8bce 8ben 8bhz 8bja 8bni 8bt 8bth 8bww 8ccm 8ccs 8clp 8czn 8dan 8dcm 8ded 8djp 8dnh 8dpj 8dtz 8gl 8gx 8jf 8nb 8pl 8sg 8xe 9aek 9alm 9arn 9auu 9bcl 9be 9bfy 9bnp 9bqe 9bux 9cei 9cet 9cn 9cpq 9cun 9cwm 9daj 9do 9dpj 9dr 9efk 9egu 9ek 9elb 9ke 9ls 9nr 9vz 9xi 9adg 9ara 9axh 9bcz 9blu 9bom 9btx 9cia 9cm 9cos 9cpq 9etr 9dcg 9dga 9dws 9dyu 9ee 9efe 9ekf 9emh 9kd 9sa af-1b fm-8mar fm-8st fo-a3z fo-a4l nc-1ad nc-1dq nc-1br nc-1ap nc-2al nc-2dn nc-9bz nj-2pz nm-1j nm-1k nm-5c nm-9a nn-m3y nr-2fg nr-cto oa-2bh oa-2tm oa-3xo oa-5bg oa-7cw oa-7dx oa-7hl od-pk9 oz-2bg oz-2xa oz-3ai oz-4aa oz-4ac oz-4ae oz-4am oz-2ae oz-4am oz-2ae oz-3aj oz-4ob sa-cb8 sa-hd4 sa-hg1 sa-fc6 sb-1aj sb-1al sb-1bk sb-1bu sb-1ca sb-2ab sb-2ax sb-2ig sb-snb sb-sql sc-2bl se-1fg su-1br su-2ak arex and glky gay hva jx 1pl nar nidk nkf shv spw ved wiz fq-pm ardi dcz aa7 hbc ngd whv wuby.

eg-2KK Radio House, Wilson Road, Smethwick, Staffs, England
(Heard during March, April and May)

1aa 1csx 1ch 1as 1py 1ql 1afn 1ahv 1bvx 1bhs 2tm 2ar 2dh 2arv 2ahm 2fm 2qv 2cyx 2cuq 2bv 3jo 3fc 3blc 3gp 3ua 3ak 3ab 3ba 3ajc 3agg 3aoh 3afn 3ro 4hz 4gp 4bn 4km 4si 4fa 4cz 4qb 4ahh 4rn 4ak 4io 5apo 5aqs 5afu 5apr 5agh 5qb 5aio 5nm 5ar 5dq 5hv 5avs 5kc 5bg 5auf 5uh 5arg 5df 5acp 5adz 5ajm 5av 5ww 5sh 5au 5ajs 5df 5ef 5aep 6aat 6abm 6aej 6am 6aod 6apa 6atc 6auk 6ax 6bgb 6bh 6bhv 6bkj 6bsd 6bvm 6bwc 6bxc 6bxd 6bzf 6gzm 6cak 6ce 6cdw 6dam 6dan 6dck 6dcr 6dgy 6dp 6ek 6ew 6fg 6gc 6kl 6oi 6ba 7adw 7aij 7ek 7gb 7jc 7wb 8axa 8anb 8avb 8amy 8bfa 8cvg 8dew 8dse 8dsy 9abc 9oex 9abm 9any 9ans 9aol 9ara 9awq 9baf 9bbh 9bbl 9bbt 9bhi 9bhr 9bi 9bl 9bna 9bak 9bwl 9byl 9bzq 9eaa 9caj 9cey 9ohs 9eib 9ejq 9cjy 9cki 9cmj 9en 9ent 9ep 9cpq 9cri 9ctw 9cwv 9cxx 9cyb 9dax 9dbc 9dbw 9des 9dga 9dij 9dip 9dkm 9dlr 9dnv 9dod 9dol 9dra 9drh 9drw 9dsv 9dyl 9eae 9eas 9edi 9ef 9eff 9efh 9ein 9eir 9ek 9ery 9ik 9kq 9kv 9bb 9bl 9bz 9mh 9nm 9ph 9qe 9rf 9um 9vy 9xm 9xx.

BRS30, P. H. B. Trasler, 37 York Road, Northampton, England
(Heard on April 3d)

1abt 1afn 1ahb 1ajx 1alr 1aot 1atx 1avf 1bbc 1bdw 1bfx 1bke 1bnm 1bxx 1clr 1cmx 1fl 1ga 1id 1jy 1kf 1lc 1lj 1mv 1nl 1nt 1rd 1rn 1sq 1us 1vw 1xaw 2aer 2akj 2akz 2alj 2apd 2agw 2atk 2atx 2aub 2avk 2awq 2awx 2axt 2aye 2be 2buy 2bxu 2bzo 2cav 2cbd 2cc 2ced 2cst 2cyg 2fc 2gk 2gg 2oi 2gh 2tp 3acm 3acw 3ahl 3ajh 3bcd 3blp 3bwt 3la 3ld 3ge 3sk 3tm 3tn 3ut 3wj 4av 4ef 4ea 4ec 4fv 4lm 4mi 4ob 4rm 4we 4wg 5oa 8abw 8ac 8adg 8afg 8aj 8agh 8avc 8cot 8cpf 8dei 8dne 8dod 8wt 9adk 9cia 9ux 9xi nc-1ad nc-1br nd-hik sh-vpa su-1cd su-1oa sb-1ar sb-1av sb-1ic sb-2ag sb-2aq.

eg-BRS63, G. G. E. Bennett, 26, Blenheim Park Road, Croydon, Surrey, England
(Heard during March and April)

1aao 1aas 1aba 1abz 1acd 1ach 1aci 1acv 1adl 1adm 1ads 1aff 1afl 1afn 1air 1ajm 1ake 1akz 1air 1amu 1ani 1anz 1apv 1aqa 1asu 1atv 1auk 1aur 1avl 1avr 1awe 1awu 1axa 1axx 1bak 1bbw 1bca 1bcg 1bcn 1ber 1bdx 1bez 1bgq 1bhm 1bjx 1bkp 1bkv 1bl 1blb 1bnm 1bnr 1bqd 1bqq 1bux 1bxx 1byv 1caa 1caw 1cd 1cdw 1cjh 1cmx 1cne 1da 1fl 1fn 1fo 1gwh 1hh 1hk 1ic 1id 1ka 1kk 1lx 1mr 1mv 1nl 1nw 1om 100 1ue 1ql 1rd 1vp 1vz 1wbj 1xaw 1xe xm 1zw 2aan 2aby 2aef 2aer 2aes 2afb 2ags 2agt 2agu 2ahe 2aiu 2aiw 2akj 2akr 2akv 2alm 2amj 2amp 2amw 2ane 2aoj 2aol 2apd 2aqw 2ard 2ase 2asz 2ato 2aua 2avb 2avk 2avw 2awx 2axd 2axy 2ayj 2bad 2bbx 2bdm 2bem 2ber 2bg 2bgz 2bow 2bs 2bur 2buy 2bvd 2caa 2cbk 2cc 2ddm 2cdr 2cgr 2ch 2cjn 2cns 2es 2cst 2csx 2cuq 2cuz 2cx 2cyq 2cyz 2da 2dq 2gk 2gx 2hc 2hp 2hk 2ih 2iz 2jn 2kr 2ma 2md 2me 2or 2pn 2qf 2qu 2uf 2uo 2vd 2wa 2wc 2wj 2wr 2xad 2xaf 2xai 3abl 3abr 3acb 3add 3aen 3afw 3agm 3ahl 3ais 3ajx 3akw 3al 3anr 3auv 3awx 3bbo 3bco 3bgg 3bn 3boj 3bqj 3bqz 3bwt 3cah 3cg 3ckl 3cjn 3cp 3ef 3fl 3gp 3hu 3iu 3jm 3ld 3mb 3mv 3ow 3pc 3ps 3py 3qf 3qw 3sh 3su 3sz 3wh 3wm 3wj 3xk 4bl 4bw 4ce 4cf 4cj 4cu 4cy 4ea 4et 4fu 4fv 4iz 4jm 4jr 4km 4ku 4ld 4ll 4lm 4mn 4nh 4ok 4on 4oy 4qb 4rm 4rp 4rr 4ry 4sp 4th 4tn 4tu 4ux 5aps 5ahp 5ads 5akn 5ao 5api 5apo 5eb 5ew 5jf 5jy 5kc 5ki 5oa 5oe 5ql 5ry 5uk 5va 5vu 5wz 5zav 6aej 6bah 6bhz 6cua 6hm 6jn 6rn 6ta 7df 7kf 7rl 7tm 7vq 8ac 8acu 8adg 8aee 8afq 8agn 8ahc 8ahd 8aj 8aks 8alg 8alm 8aly 8ask 8axa 8aqu 8auc 8avl 8bag 8baj 8bau 8bct 8bde 8ben 8bja 8bk 8bou 8bpq 8bql 8bt 8bto 8bwa 8bww 8bxr 8cau 8ccq 8ced 8ces 8cfr 8cko 8cln 8clp 8cnt 8cnx 8coa 8cpf 8crj 8cse 8cvj 8cyd 8dbc 8dbd 8dbl 8dem 8dcr 8dgj 8dgp 8dgx 8dia 8diq 8dja 8dkx 8dod 8dpa 8dqk 8dqz 8drj 8eq 8es 8ex 8fp 8gl 8im 8jf 8li 8lt 8re 8ut 8vj 8zg 9aek 9arn 9awz 9axq 9bcl 9bcs 9bmx 9bpb 9bpl 9bpm 9bqe 9bqi 9bre 9bux 9bwl 9bwo 9bwq 9caj 9ccv 9cdr 9cei 9cet 9cja 9ck 9cki 9cmv 9en 9epm 9cpq 9etg 9etr 9evy 9cwe 9cxx 9dcu 9dga 9dgm 9dju 9dpj 9dr 9eas 9ebj 9ebp 9ee 9eev 9efk 9efo 9egh 9ei 9eiz 9ek 9ekf 9hd 9jr 9lc 9sd 9sj 9sy 9to 9xi.

Frank Pemberton, 115 Cambridge Road, Wimbledon, London, S.W. 20, England
(Heard from Apr. 21 to Apr. 22 on 20 meters)

1auk 1byv 1bf 1bgw 1cdp 1cpb 1yd 2alm 2bal 2bj 2ch 3akw 4dm 8ahd 8alg 8baj 8bde 8bau 8bdp 8csr 8cil 8cmb 8djv 8ily 9alm 9aex 9bmx 9bwo 9bqq 9cbt 9cib 9cpq 9ef.

40 meters (Heard from Jan. 1 to Apr. 23)

1asf 1ale 1aof 1amu 1air 1asy 1amd 1axr 1akz 1adm 1azd 1avl 1amp 1arn 1abx 1atg 1axx 1aao 1aur 1alr 1apu 1asa 1avf 1azw 1anx 1ads 1bkp 1bhm 1bux 1bdw 1bxl 1ckp 1cez 1cf 1cmf 1cnz 1cra 1ev 1cki 1cd 1cmx 1di 1ej 1ga 1gp 1gh 1hj 1ic 1in 1id 1kk 1lc 1mv 1my 1nq 1or 1pa 1qu 1ql 1rd 1sw 1uz 1vc 1we 1yd 1yb 1zd 2agn 2awu 2aas 2ahm 2avr 2azk 2ayj 2aqw 2arm 2apd 2aev 2atk 2aby 2avk 2ags 2aub 2awq 2ahe 2atc 2amj 2avg 2bad 2bsl 2buy 2bwa 2baa 2bm 2bzo 2bir 2bbx 2cyx 2cuq 2ced 2ch 2cdr 2cs 2cjb 2cep 2dh 2dc 2fo 2fc 2gp 2ge 2kw 2md 2nz 2nm 2od 2pv 2rs 2tp 2uo 2xo 3ajc 3ay 3any 3ahl 3afw 3acw 3acm 3akw 3bwt 3bhv 3ckj 3vkl 3cds 3cah 3ef 3gp 3gx 3hg 3jo 3ku 3ld 3pf 3qe 3qf 3sk 3tn 3zo 4ak 4aah 4aao 4bn 4cv 4dd 4ft 4gx 4hx 4hy 4iz 4io 4it 4ll 4nh 4ob 4rr 4rm 4ry 4tu 4tk 5he 5ew 5zav 6oi 6bzf 8ade 8aly 8afq 8anc 8avj 8alf 8aad 8aj 8bth 8bja 8bpl 8bjb 8baj 8cwt 8cfr 8cjm 8cau 8drj 8dsy 8dan 8gz 8im 8lt 8rh 8vx 8zae 9adn 9aao 9aek 9arn 9be 9btz 9brc 9epm 9cn 9cyw 9cwn 9dqw 9dqr 9dvg 9dr 9dih 9mn.

B. & F. Smith, 101 Highfield Rd., Saltley, Binghampton, England
(Heard during April on 20 meters)

1aba 1aci 1ajm 1akz 1amu 1aqa 1asu 1axx 1bhm 1bkv 1bqt 1byv 1bux 1bvl 1ca 1caw 1cax 1cfg 1cfo 1cmx 1cpb 1era 1df 1io 1ka 1my 1nk 1om 1pm 1sw 1ue 1uw 1xzc 2aer 2ahm 2alm 2amj 2anm 2bat 2bg 2cmx 2jn 2nm 2or 2qu 2rc 2tp 2we 3ade 3akw 3bwt 3cch 3cfq 3gb 4fa 4dm 4km 4oh 5dq 6als 8ade 8adg 8ahc 8aks 8alg 8aly 8ask 8avd 8axa 8axd 8bau 8bd 8bdc 8bde 8bdp 8bna 8cdb 8cil 8clp 8cmb 8cse 8csr 8dgx 8dhx 8djv 8dm 8drj 8day 8oq 8wt 8zg 8zz 9anz 9bhh 9bki 9bmx 9bpm 9bqq 9cea 9cei 9ck 9en 9evn 9cvr 9dga 9dgi 9djv 9eas 9eho 9ek 9emb na-7mn np-4je nc-1ar nc-3fc nc-3gg nc-3kp nc-3mp fo-a5x sb-1ad sb-1aw sb-2ab crha.

30 to 50 meters

1alr 1aur 1avf 1avl 1bfx 1bym 1cjc 1cpb 1cng 1dee 1gh 1hh 1mr 1nq 1sd 1uw 1xm 2ags 2ahm 2amh 2avw 2bur 2bxu 2cep 2nm 2uo 3adl 3ahl 3cah 3gp 3id 3qw 3us 3vf 4aao 4ef 4km 4ll 4ok 6hm 8bja 8bxn 8box 8edv 8efr 8eln 8env 8dan 8dcm 8nt 8oq 9amo 9buz 9dr 9xe 9xi nc-1ad nc-1dd nl-ip ai-2kx oa-2ak oa-2no oa-2sh oa-3bq oa-4bd oa-7cw oz-4aa af-ib af-hva fo-a5t fo-a6n fo-aga su-1fb su-1na su-1oa su-2ak sa-cb8 sa-db2 sa-de3 sa-en8 sa-ha2 sb-1aj sb-1al sb-1ba sb-1bo sb-1br sb-1ck sb-1ib sb-1ic sb-1id sb-2aa sb-2ad sb-2aj sb-2ar sb-2av sb-2ax sb-5aa sb-7ab sc-2ar sc-2as sc-2bl.

Miss B. Dunn, Stock, Essex, England
(Heard during April)

1ads 1aur 1axx 1bfx 1bhn 1bms 1bng 1dee 1lx 2apd 2ase 2ayj 2bqh 2cuz 2cvj 2vd 2xaf 3of 4ce 4gp nc-1ad nm-cyy nn-m3y ni-tfhv sb-1ad sb-1aj sb-1aq sb-1aw sb-1ax sb-1ib sb-2ag sb-2ap sb-2ar sb-2id sb-5aa su-1br su-1ed aq-1mdz ar-ocby ec-2yd ed-oic ed-oik eh-9oc el-oslo em-sgl em-sjb em-smsh em-smtn em-smuv em-smyg et-tpsa et-tpai fi-1cw fm-8gat fm-8jo fm-8ju fm-8rit fm-tun2 fq-pm od-anf kdr naa nivd wik wuby wvc 2xt 8xa 9pz 9wj ei xm f9c sok.

BRS-64, R. G. R. Lyon, 37 High St., Aberystwyth, Wales, Great Britain
(Heard during April)

1asa 1gh 1afa 1epb 1cjh 1alr 1ga 1afn 1ic 1ejc 1amd 1adm 1cd 1kl 1asy 1clv 1axx 1mv 1aff 1aac 1axa 1bkk 1aur 1ckz 1bnm 1aau 1amu 1wl 1cms 1rn 1nl 1ckp 1lx 1af 1ajm 1kk 1mv 1lw 1mg 1ll 1ia 1amx 2bm 2oe 2ags 2kr 2oh 2amh 2ts 2amp 2nse 2aog 2cgr 2vh 2nzw 2evj 2bxu 2apd 2axa 2rs 2cuz 2aur 2anx 2atx 2za 2tp 2apa 2nm 2ahm 2bm 2awg 2aon 2ayj 2gk 2agj 2bv 2avk 2awx 2qu 2awu 2bbe 2cdr 3bwt 3qf 3oq 3abr 3iu 3ckl 3anx 3akw 3ads 3ade 3bw 3cfg 3adb 4ce 4iz 4fa 4ei 4dd 4du 8cln 8djv 8bes 8csr 8alg 8bau 8djv 8adm 8aj 8bpg 8cpf 8axa 8aks 8boy 8don 9aex 9ek 9cki nc-1ad nc-2fo nc-3fc fi-1cw su-1by su-2ak sb-2ib sb-2ia sb-2aa sb-2aq sb-2aj sb-2ig sb-2ic sb-2ax sb-2ar sb-2ab sb-2id sb-1ad sb-1aj sb-1id sb-1ck sb-1ar sb-1aw sb-1br sb-1id sb-1ib sb-1ic sb-1ak sb-1hf sb-1bo sb-1ca sb-1aq sb-5aa sa-hgg sa-bgc sa-hg1 sa-db2 eu-1ua eu-15ra sc-2bl sc-2as ai-2kx as-1lra np-ck4 np-4oi fg-fm oz-3ar oa-2mh fe-egez fc-f2.

S. Jamieson, 2/28 Russell St., Brixton, London, S. W. 9, England
(Heard during April on 30-45 meters)

1aae 1aau 1abz 1ach 1aci 1adm 1afn 1ahv 1ajf 1alr 1amu 1apv 1asa 1asy 1aur 1bak 1bcr 1bez 1bfx 1bgq 1bhm 1bke 1bms 1bux 1cje 1cjh 1ckp 1cpb 1csr 1de 1gh 1id 1ii 1lc 1lj 1lu 1lx 1mdz 1mv 1my 1nl 1ql 1rd 1rf 1rn 1so 1wbj 1we 1yb 2abp 2agt 2ahm 2amj 2amp 2apd 2api 2apq 2atx 2avb 2avg 2avw 2awx 2axr 2bbx 2bir 2bow 2buy 2bxu 2cgr 2cjb 2cuq 2cvj 2cxl 2czr 2dg 2gk 2hc 2tf 2tp 3ahl 3bco 3ce 3cjn 3ckl 3ef 3gp 3hg 3kr 3ld 3pf 3py 3qf 3ow 3sh 4bn 4ce 4fv 4hy 4ll 4nk 4ok 4oy 4si 4tu 6hm 6rn 7tm 8adg 8afq 8aks 8auc 8brc 8cpf 8cro 8drj 8li 8lj 8vx 9db 9eli 9vo sc-2bl sb-1ao sb-1ap sb-1at sb-1aw sb-1ib sb-2ab sb-2ap sb-2ar nc-1br nc-1cx nc-2bg nc-2fo fm-nai et-tpai eagp eake eaw3 wuby jx wgy (tel).

ef-8FT, R. Aronssohn, 2 bis rue J. Deville, Colombes, Seine, France
(Heard from Mar. 1 to Apr. 26)

1bbm 1abn 1ga 1abr 1my 1gr 1akg 1aff 1aci 1bkc 1epc 1bfl 1ajf 1cmx 1ahr 1asa 1amp 1ii 1aic 1uu 1adm 1bkv 1xf 1eau 1mr 1epc 1bez 1ckp 1mv 1ic 1cmp 1rd 2cvj 2agn 2bug 2bm 2auc 2ahm 2czr 2bj 2bur 2gk 2ard 2fo 2apf 2uo 2amp 2cug 2agi 2ayj 2bem 2agu 3iu 3gf 3ahl 3cv 3bu 3egg 3bav 8ll 3bwt 3di 3ah 3acm 3hm 4io 4te 4za 4czl 4hy 4sx 4tr 4it 4qy 4ft 6hm 6bjx 7ek 8xe 8zm 8bho 8rt 8cnx 8day 8aj 8adm 8gz 8aly 9ep 9aya 9eev sb-1ib sb-2id sb-2af sb-1aw sb-2ag sb-1no sb-1aw sb-1ak sb-1ar sb-1ag sb-1ac sb-2ab sb-5ae sb-1ck sb-1id su-1cx su-2ak su-1cd nc-2bg nc-1ad nc-1aw nc-2fo nb-2pm nj-2pz ns-aa7 nd-hik xawp x123 x8fmb sc-2ar sc-2ar sc-2ac sc-2ah sc-hgl sa-hd4 ar-8lha af-1b op-1au hva fqpm fo-a8p oz-4aa arex wuby.

ef-RO91, C Conte, 24, Allee du Rocher, Clichy-sous-Bois (S-et-O), France

1acg 1acv 1ajx 1akm 1asa 1asy 1aur 1axx 1awe 1chw 1dd 1ga 1gh 1he 1ic 1is 1lx 1nq 1py 1rn 1xm 1xw 1kk 1wbj 2aan 2abp 2agu 2ahb 2ahe 2amp 2aon 2arv 2ase 2aub 2avk 2axd 2axe 2axh 2ayj 2awx 2bbl 2bow 2buy 2cbd 2cdr 2cgr 2cuq 2hc 2hr 2iz 2kx 2me 2pw 2uf 2um 2vd 2wj 3afa 3ahl 3aiv 3ajx 3al 3bco 3buv 3bwt 3ef 3gp 3hc 3hg 3id 3mv 3nz 3pf 3qw 3ow 3sh 3sx 3uo 3mk 3py 4cj 4cy 4db 4dd 4fa 4jm 4ll 4nn 4on 4ox 4ok 4qq 4rp 5amn 5ax 5jy 5ry 5uk 6hm 7df 8adg 8aef 8aj 8alt 8arx 8aym 8baj 8bct 8bhz 8bou 8buj 8bwa 8bww 8bt 8ccs 8ces 8cmp 8cfr 8cpf 8cpq 8cvd 8cwd 8dds 8dbl 8dcm 8djm 8dli 8dpa 8dld 8dsm 8kf 8lt 8wsw 9ak 9arn 9baz 9be 9ceb 9cet 9cmv 9cue 9dxm 9sa 9uz 9vv nc-2bb nc-3bt nm-1j nr-cto.

S. W. Hecker, Camp St. Temora, N. S. W., Australia

2cs 2cux 2kx 2fj 4js 5jf 5va 6aiv 6ta 6bkd 6bkj 6zat 6cmq 6im 6ngg 6byz 6cmg 6dqt 6or 6amm 7df 7lr 7adg 8drq 8gz 8nt 9cv 9hp 9zk 9xi 9day 9dul 9adk 9cei 9efk oh-6dda oh-6buc oh-6acg oh-6bwv oh-6cxy ef-8yor ef-8el ef-8ca ef-8qrt ef-8aqm ef-8fj nc-5aj nc-4hh nc-5ya nc-4du aj-1sk aj-jkzb aj-1sm aj-1fm oz-1fb oz-1fe oz-1fs oz-2bp oz-2gg oz-3cc oz-3ac oz-3xb oz-4ao oo-dgk ey-1hw eg-5xy am-2se op-1bd nj-2pz eb-4zz el-1xla af-hva ei-1av whr gbk glq bxy and kft 8st oct ngy ml.

C. Harrisson, Rokeby Rd., Bellerive, Tasmania, Australia

1aao 1aap 1adm 1aga 1aid 1akx 1air 1amd 1amq 1arc 1axx 1bal 1bez 1bke 1bms 1bqq 1cmf 1cmp 1cmx 1cpb 1dl 1ga 1ii 1in 1ja 1lp 1mv 1nt 1oa 1rd 1rf 1ro 1xaw 1xm 1yb 2agp 2ags 2akj 2auh 2bur 2adl 2ase 2aub 2avm 2ayj 2cka 2cla 2cns 2cyh 2ced 2gk 2hr 2mk 2or 2qh 2uo 2xo 3ade 3ahl 3al 3bqt 3ckl 3ee 3hg 3qw 3te 3ue 3vf 4ix 4ll 4nh 4qb 4rm 4tz 5aq 5aqe 5aua 5dq 5fm 5rg 5rh 5uk 5ux 5wz 5zai 5zav 6acz

6adh 6adp 6agr 6aiv 6aix 6akw 6am 6aoi 6avb 6bgt 6bia 6bjf 6bkh 6blh 6bux 6bvb 6bvv 6bvy 6bxn 6baf 6byz 6cgw 6chn 6cmq 6cnk 6cnm 6cuq 6czk 6dba 6dey 6dgy 6dfr 6dhq 6gw 6hj 6hu 6im 6ja 6kq 6ol 6rj 6ta 6ty 7abf 7abg 7bm 7df 7ec 7ll 7ly 7lz 7mp 7no 7pu 7tj 7xf 8abw 8ade 8adg 8adm 8aip 8aj 8aly 8asb 8baj 8bev 8ben 8bo 8bww 8cau 8ccq 8chz 8cw 8dbl 8ddn 8djp 8dme 8drq 8ll 8lt 8sh 8vx 8xe 9adk 9ahq 9asd 9axz 9agq 9bht 9bkq 9cel 9cia 9cmj 9cn 9end 9cvn 9day 9doe 9dyz 9efk 9eli 9eme 9ezi 9kv 9mo 9mr 9nk 9oo 9ux ea-gp eb-k44 eb-wl eb-4rs eb-h5 eb-4ax eb-4an eb-4zz eb-4ar eb-k6 eb-4ar eb-4ww eb-4au eb-4cb ef-8yor ef-8jr ef-8ix ef-8fk ef-8fr ef-8cs ef-8br ef-8jf ef-8jn ef-8fix ef-8ct ef-8ei ef-8px ef-8cp ef-8am ef-8ab ef-8mm ef-8jne ef-8fn ef-8ycc ef-8dl ef-8cl ef-8fj ef-8rdi ef-8udi ef-8gi ee-ar44 eg-2ao eg-2od eg-2az eg-2lz eg-5xy eg-5uw eg-6qw eg-2cc eg-6ww eg-2gy eg-2xv eg-2wj eg-2qm eg-2kf eg-5ma eg-2dr eg-2nh eg-2j eg-2db eg-5yk eg-5yx eg-5kz eg-5up eg-2xy eg-5jw eg-6vj eg-6qh eg-6yu eg-6vp eg-5nw eg-6ko eg-5nj eg-6mu eg-2lt ei-1ay ei-1gw ei-1ma ei-1er ei-1no ek-4uah ek-4ya ek-4dba el-1x el-1f en-opm ep-1ae es-2co es-2nm ac-8em ac-2ff af-1b aq-ges as-rao8 na-7aam nc-1ad nc-2bg nc-4bn nc-4du nc-5ct nc-5go nc-5hp nc-5ya nc-9bz nm-5b nr-cto sa-hb5 sa-hd4 sb-2aj sc-2as sc-2bl su-2ak fk-kte fo-a4l fo-a3b fo-a3x fm-8st oh-6nl oh-6brk op-1au od-pkg sk1 sk2 hva abl wpa nezb gfr gfy wi3 5fs ved kfzh acs aqe ardl arcx.

su-1CG, W. Figueira, 1070 Magallanes St., Montevideo, Uruguay

1aeo 1cmx 1hj 1mv 1zs 2amj 2arm 2cka 2cs 2uo 3iz 3ll 4bck 5acl 5rm 6ahn 6buc 6bzo 6ckv 6caw 8aad 8bau 8bkd 8dgp 9cpm 9xi ac-1cn ac-2ff ac-2as ac-8flo ac-8em ac-8xx aj-1ab aj-1pp aj-1ka aj-1ko aj-1sh ap-1sm ap-1xb aj-3aa aj-3az aj-3ww aj-3yz ef-8gi ef-8jj eg-5dh en-oro fm-1fm fo-a3e fo-a3w fo-a4l fo-a4v nc-3bl oa-2aa oa-2zh oa-2yi oa-3wm oa-4bd oa-7hl op-1au op-1hr op-3ac oz-1af oz-1an oz-1fb oz-1fe oz-1fq oz-2ae oz-2ak oz-2at oz-2bd oz-2bg oz-2br oz-2bx oz-2ga oz-2gc oz-3ai oz-3aj oz-3ar oz-4aa oz-4ac oz-4ai oz-4am oz-4ao ffjp jkxb nuqg.

eb-4XE, Roger J. Parent, 183 Chaussee de Heusy, Verviers, Belgium

1aev 1ajf 1ax 1amu 1abi 1aff 1aci 1ahm 1air 1cff 1cfx 1chs 1gr 1mdz 1mv 1nc 1ng 1lc 1py 1rd 2amp 2avl 2ahu 2afu 2apd 2agm 2bem 2ckp 2cvj 2ecd 2eug 2hc 2mb 2md 2rs 3add 3cah 4bn 4bl 4cv 4du 4eu 4ll 4md 6akk 6jn 8aly 8arg 8cnh 8cpf 8xe 9act nj-2pz ns-sop nr-8jc sb-1ib sb-2ag sb-2ar sb-2ax sb-5aa sb-5ak sc-2as su-2ak su-1cd oa-7hp oz-4aa oh-6kkn oh-6bgf fo-a4x fo-a9a fi-1cw fi-1ta.

nm-1E, M. Veramendi, Sor Juana, 119 Mexico, D. F.

1er 2ar 4rc 5av 5uk 5atf 8jf 9ln 9da 9tl.

1BUX, Touisset, Mass.

20 Meters

nc-4bt nc-4fv nc-5fk nd-hik ne-8af nj-2pz nl-1p np-4sa sb-1ad sc-3ag su-2ak su-1cd eb-4au eb-4ax eb-4bc eb-4ww eb-4zz ed-7cz ef-8aro ef-8bf ef-8ct ef-8gi ef-8gm ef-8jn ef-8udi ef-8yor eg-2ao eg-2oc eg-2kf eg-2od eg-5yb eg-5hs eg-5ku eg-5mq eg-5yz eg-6bd eg-6yq eg-6yv eg-6mu ei-1er en-owe fo-a3z fo-a4f fo-a5x fo-a6n oh-6agg oh-6bdl.

40 Meters

oa-2ay oa-2bb oa-2cg oa-2cm oa-2ds oa-2dy oa-2ga oa-2gw oa-2ij oa-2jy oa-2mh oa-2ms oa-2no oa-2rc oa-2rj oa-2rt oa-2rx oa-2sh oa-2ss oa-2tm oa-2wb oa-2we oa-2yh oa-2yi oa-2yj oa-3bd oa-3em oa-3es oa-3ls oa-3wm oa-4bd oa-4nw oa-4rb oa-5bg oa-5bw oa-5by oa-5dx oa-5hs oa-5ja oa-5sa oa-5wh oa-5xo oa-6mu oa-7cw oa-7ox oa-7hl oz-1an oz-1fq oz-2bg oz-3aj oz-4aa oz-4ac ea-gp eb-n33 eb-4au eb-4rs eb-4ww eb-4zz ee-ar18 ee-ar44 ef-8cs ef-8fr ef-8ix ef-8gi ef-8lx ef-8jf ef-8max ef-8ng ef-8udi ef-8yor ef-8saw ef-8es eg-2oc eg-2xy eg-5xy eg-6mu eg-6td ei-1au ei-1co ei-1no ei-1pl ek-4dba ek-4oa ek-4uah ek-4uu ek-4ya el-1a el-1w el-1x em-smtn em-smuk en-oga en-ocmx ep-1ae ep-3fa es-2co es-2nd fm-8st fm-ocrb fo-a3b fo-a3e fo-a3e fo-a3m fo-a3p fo-a3w fo-a3x fo-a3z fo-a4e fo-a4q fo-a4y fo-a4x fo-a4z fo-a5o fo-a5t fo-a5x fo-a5z fo-a6l fo-a6n fo-a8p fo-a8s fo-1sr fq-pm sa-cb8 sa-fc6 sb-1al sb-1ap sb-1aw sb-1ib sb-1id sb-1br sb-2af sb-2aj sb-2ag sb-2as sb-5aa sb-7ab sc-2ar sc-2as sc-3ag sh-bzl su-1am su-1bu . su-1cd su-1fb su-2ak sv-ayre nl-4x nn-3yn nr-cto.

1SZ, Clark C. Rodimon, c/o A. R. R. L. Hq., Hartford, Conn.

(40 meters during International Test)

ea-gp eb-4ac eb-4af eb-4ar eb-4au eb-4ax eb-4rs eb-4ww ef-8px ef-8gi ef-8fr ef-8ct ef-8sm ef-8eo ef-8jf ef-8cc ef-8ku ef-8fix ef-8qrt ef-8tis ef-8pel ef-8ddh ef-oeo ef-8ft ef-8eo eg-5ls eg-5by eg-5xy ei-1no ei-1er ei-1gw ei-1uu ei-1cr ei-1ay ek-4oa ek-4sar ek-4uah ek-4uu en-oga ee-earl0 ep-1ae ep-3fz er-5aa es-2co et-tpal nm-1aa nm-1j nm-1n nn-m3y nn-1nic nq-8kp nr-2fg nr-2gph nz-ez5 sa-cb8 sa-fc6 sb-1ic sb-1aw sb-1ar sb-1ck sb-2af sb-1ax sb-1br sb-1ca sb-7ab sb-1id sb-1aq sc-2bl sc-2as sc-3ag sc-1ck sc-2ar su-2ak su-1oa sv-ayre fm-8ma fq-pm fz-1ap oa-2rt oa-2sh oa-2yi oa-5hg oa-3bq oa-6mu oa-2wc oa-7cw oa-3hl oa-2rc oz-4aa oz-3ar oz-4ac oz-2ga oz-2me oz-1fs oz-1fq oz-2ae oz-4av lmm ardl aqe pcuu nau naa nidk wbny.

2CMX, S. G. Meyer, 240 Washington Ave., Rutherford, N. J.

(Heard on 20 meters during April)

4dd 4dm 4fa 4fi 4km 4ok 4rm 4zi 4xe 5bh 5qs 5tt 5uk 5vu 5wz 5ado 6aqe 6arf 6ata 6ea 6fr 6ig 6km 6lh 6rn 6aod 6bhq 6bil 6bpg 6bux 6bxg 6cyz 6dck 7cz 7ek 7mh 7to 9en 9db 9ek 9er 9jl 9kv 9ll 9mh 9aex 9ahq 9amq 9anu 9anz 9aok 9arl 9atg 9avg 9bad 9bbt 9big 9bkn 9bmx 9bqq 9brm 9bwo 9byl 9caa 9caj 9cbt 9cjs 9cjy 9cki 9emj 9epq 9esi 9exx 9dce 9ddz 9dpb 9dpw 9drw 9dsg 9duh 9dwd 9ecz 9een 9efo 9ege na-7mn nc-1ap nc-1ar nc-1co nc-1dx nc-3gg nc-4ek nc-4fv ne-8af np-4sa eb-4ax eg-5hs eg-5yx eg-6mu ef-8ct ef-8yor sb-1ad sb-1ak sb-1aw oh-6bdl.

6ZT, 247 East 7th South St., Salt Lake City, Utah

8bt 8lt 8dms 9cit 9cxc 9dge 9dzl 9to nc-5ef na-7jd nj-2px ef-8jf ef-8jn oa-2bg oa-2hx oa-2rc oa-2rt oa-2ss oa-2uk oa-2yi oa-3al oa-3aj oa-3dc oa-4ak oa-4bd oa-5dx oa-7bq oa-7dx oa-7hl oh-6cfq oh-6cxy oz-1an aqe arcx ardi bam ido jx 1gn ocl ved xc51 xc55.

8BAU, F. R. Gibb, 2639 Neil Ave., Columbus, Ohio

(20 meters)

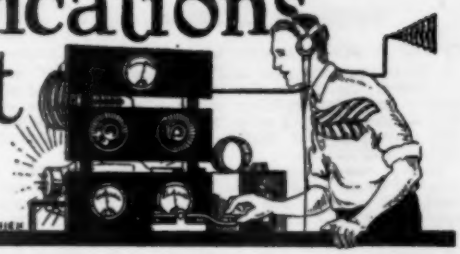
1aba 1abl 1afff 1ahi 1asf 1axs 1axx 1bhm 1boe 1byv 1cv 1cfo 1ia 1lb 1ry 1sw 1uw 1zs 2ag 2agp 2apa 2apb 2awz 2brb 2bsh 2cst 2ctg 2dck 2hj 2ow 2xbc 2xg 3ckg 3cks 4bl 4om 4gs 4hv 4hx 4io 4iz 4ou 5abp 5acl 5agb 5ahg 5ahk 5ain 5api 5apj 5aqe 5aas 5bd 5bh 6am 6ann 6aou 6awk 6bau 6bjb 6jl 6bzm 6caw 6cca 6ccl 6cgw 6che 6clw 6ckv 6cls 6cuc 6dbw 6ddw 6gj 6ql 6rn 6zat 7aae 7ca 7da 9ah 9anb 9ano 9aon 9awb 9bad 9bhi 9bg 9bjp 9blu 9bmx 9bqqq 9bye 9cae 9cal 9caw 9cho 9ciw 9cjr 9ckv 9csi 9dbz 9des 9dgr 9djg 9dnb 9dsy 9dvl 9eae 9eao 9efs 9el 9jk 9kq 9ku 9lb 9lz 9mh 9qu 9rf 9ob 9vk 9xm 9xx ne-1ar nc-1cg nc-1ap nc-3cg nc-4dw nc-4fv nc-5bk nc-5fk nd-hik nj-2px np-4sr eb-4ac eb-4au eb-4zz ef-8ct ef-8gm ef-8jj ef-8yor eg-5hs eg-1od eg-2nf eb-bvj ei-1er ei-aed sc-1cd sc-2ak sc-3ag su-1ak su-1ag sb-1ao sb-1ab oa-2yi oa-4ac oa-5bg oa-5lf oh-6acg oh-6cxy oz-1an oz-2ac oz-2re vs-1ab fo-a5x wiy lw wik dcrr snt kogl.

8CFL, Charles Justice, 433 S. 17th St., Columbus, Ohio

(20 meters)

1abz 1adm 1air 1ai 1aqt 1awe 1aun 1bbs 1bis 1ayg 1cfo 1clm 1df 1mk 1ka 1bkv 1bag 1sw 1byv 1ue 1rw 1se 1zs 2ahm 2awk 2gk 4fa 4iz 4qb 4xe 5afb 5ako 5amt 5apg 5avs 5bd 5uk 5wz 6am 6aod 6bau 6bux 6bil 6dfe 6dct 6ckv 6fr 6kg 6nx 7aij 7jf 7ne 8aly 9acf 9arl 9anz 9amq 9brh 9ahq 9byc 9byl 9dgr 9dkl 9dfr 9ejt 9dcm 9dbz 9ewn 9dpb 9exl 9cde 9duh 9cjs 9epw 9kv 9qy 9eki 9bad nc-1ad nc-1ak nc-1ap nc-1ar nc-1co nc-1dx nc-4dp nc-4dw nc-4ek nc-4fv nc-5bf np-4je np-4sa eb-4ax ef-8ct ef-8yor eg-2nh sb-1ad sc-3ag su-1cd su-2ak perr.

The Communications Department



F. E. Handy, Communications Manager
1711 Park St., Hartford, Conn.

Expeditions

The *Putnam Baffin Island Expedition* sailed north from Rye, New York again, Saturday June 11 and will probably be gone for about four months. This expedition will explore and chart the central portion of the western coast of Baffin Island, a spot probably unvisited since Luke was there in 1631. Trips inland will be made in an attempt to locate an ice-cap and to chart lakes and territory never previously explored, crossing the island to Cumberland Sound. A radio transmitting station will probably be used at a location nearer the earth's magnetic pole than ever before and any unusual performance investigated.

Ed Manley (8FJ) is the chief operator on the *Morrissey*, VOQ, and Munroe Banard will assist in handling the base station when Manley is out with the low-power field set (an 852 supplied by Eveready B-bats) which will be taken inland. VOQ will handle press with 2UO and all general traffic by amateur radio just as last year. Look for VOQ on 33 meters. 500-cycles will be used most of the time on the 500-watt set though DC is available, too. The set will be operating on "20" after the expedition is far enough north, so keep an ear open there also. Remember the narwhal tusk awarded to Miller of 9CP last year for best work with VOQ? More valuable and interesting souvenirs will be collected this time and there will again be an unusual award for the station-owner doing best work for the expedition. On your toes for work with VOQ, gang, and let the reports for Manley come via Hq. so we can follow progress regularly thru these columns.

The communications arrangements of the *Wilkins Arctic Expedition* are working out very successfully according to latest reports from Mason at KFZG (Point Barrow). Besides amusing the matter-of-fact natives with short-wave broadcasting from PCGG and WGY (to which the Eskimos say "Ahdegah," meaning FB), weather, news, and messages are handled on schedule with KFZH at Fairbanks, Alaska. Hemrich of KFZH keeps a regular Monday and Friday 33.5 meter schedule with the States, nu7BM being the lucky station. nc4DU reports KFZH as putting a good crystal-controlled signal into his part of the country. nu9DNG was also QSO late in May and oh6BWV worked KFZH and took some traffic with the help of oh6AXW. From the northern-most tip of Alaska, Mason of 7BU sends a list of calls heard during April for the gang. Here they are:

1avh 1bcr 1bma 1bms 2bl 2fj 2mu 2uo 2xt 2axr 2cbr 2xbc 4ll 4ok 4pd 4si 5em 5fs 5of 5atf 6ad 6dp 6gw 6hm 6ja 6xi 6aak 6aat 6aij 6alt 6aye 6bdc 6bjl 6bjv 6bwv 6bxi 6byz 6baf 6cfq 6coa 6css 6csw 6cxy 7am 7bm 7br 7df 7eb 7ek 7er 7fh 7ls 7gz 7mn 7qb 7tj 7uh 7abb 7abe 7abk 7aeb 7ali 7acs 8ac 8aly 8atl 8bau 8ben 8bja 8cjb 8cve 8dcb 8dcm 8dhs 9be 9bf 9by 9ek 9qf 9rk 9uu 9wi 9xi 9adk 9ahm 9alw 9apm 9arn 9auu 9avh 9bfm 9bfy 9btr 9cei 9cet 9cfu 9cos 9cpm 9cpn 9cvy 9cya 9cye 9exw 9deq 9doe 9efk nc-5aw nc-1dq nc-5fs aj-1gs eb-4ar eb-4rs eg-5bg eg-5xy el-1alx eu-1nn ef-8bf ef-8cl ef-8jf ef-8jj ei-1no en-0ga es-2co oa-2jt oa-2jy oa-2nj oa-2rb oa-2rt oa-2sa oa-2uk oa-2wb oa-2wc oa-2xi oa-3bq oa-3dc oa-3jk oa-3lg oa-3vp oa-4bd oa-4bq oa-5hg oa-5lf oa-5wp oa-7cw oa-7gh oz-1af oz-2bd oz-2bg oz-2gn oz-3ar oz-4aa oz-4ae oz-4ak oz-4am oz-4ar xe5l (fone) nu-2xg nu-2xs kdka dfkx wgy pcgg (Misc.) at agb agc agw arcx b2 bam bol2 cka cto ido irl jkzb jna jpa kdfu kel kft kfim knux naa nba npa npc npg npm npn npo pca pcpp ra03 sfv sgl sok wik wiz wut wux wvc wvy wuaj.

The *University of Michigan Greenland Expedition*, nx1XL, uses a 250-watter on 25, 35, or 45 meters wavelength. Operator Paul Oscanyan, Jr., (2AZA) advises that schedules may be arranged via radio and that nx1XL will probably be on the air on or before August 1, 1927. The outfit will be operated Mon., Wed. and Friday from 8pm EST to conclusion of traffic. Sunday operation will be from noon to 1pm EST on 25 meters. Outside the 9 to 9.30pm schedule with 8AXZ all time will be filled with schedules made by radio excepting from 8 to 9pm daily for general QSO and traffic work. Better listen for nx1XL and make your schedules early before all the time is filled, OMs.

Both a portable outfit for field contact with the base station and a more powerful set (mentioned above) are going along. The portable will operate from Burgess B-bats while an Esco generator run from Exide storage batteries which in turn are charged from a 32-volt Delco outfit provides power for the "250." Some 210's, H-tubes, and a spark-coil are carried for any emergencies that may arise. The expedition will study meteorological conditions and the radio whims of the arctic. A base camp on the inland ice will first be established. Bamboo sectional masts will be used. A CR18 short wave and the new RCA IP5OIA medium wave receivers (with a 503 long-wave coil unit) are being taken along. The expedition will go further north and base at a higher elevation this year.

The *Borden-Field Museum Arctic Expedition* (KGEG) working nightly on 37.5 meters and daily on 23 meters sailed North from Oakland, Calif., April 30. The schooner-yacht *Northern Light* will collect live and mountable museum specimens for the Field Zoo and Museum at Chicago after outfitting at Vancouver, B. C., QRD Kodiak Island, Pribilofs, Nome and the Arctic Sea.

We are indebted to Mr. A. Binneweg, Jr., 6BX-ex6XAA for a description of the radio equipment. A 600-meter transmitter and receiver in addition to the 100-watt short wave outfit is located in a two-by-four radio room right under the main mast. A tuned-plate tuned-grid circuit is used in the transmitter the coils being of silvered copper tubing of the plug in variety to make a quick QSY possible. The outfit was built by R. W. Hart (Chief operator of KGEG) and Binnewag (6BX). W. E. tubes with .0006 µf grid and plate blocking condenser are used. A 1000-volt M. G. supplies power, keying the high voltage being accomplished with a Leach relay. A short vertical antenna is used against ground. Operator Hart requests all amateurs to listen for him and help QSR Chicago. All cards sent to him at 30 Grand Ave., Oakland, Calif., will be acknowledged. Look for KGEG on 23 and 37.5 meters, gang!

The *Marshall-Field Expedition* in Alaska has an outfit on 37 meters (WMBE) and 9AXZ tells us to QSL the sigs via Sears Roebuck (WLS) Chicago, Ill.

3AHL (903 Hanover Ave., Norfolk, Va.,) gives us the QRA of xCBZ as a ship on an around the world cruise via Panama, Australia, India and the Mediterranean Sea—at this writing between Australia and India. During the 5 months cruise xCBZ is using a UX210 with 750 volts dynamotor supply. Cards may be sent thru 3AHL.

Real Amateur Coöperation

By Charles N. S. Ballou, op3AB

THIS is offered apropos an article by F. Johnson Elser appearing in *QST* for December, 1926, entitled, "As Others See Us." May I invite your attention to a transmitting amateur who practices *all* that he preaches? I refer to this same Elser, who is also the proprietor and brass pounder in chief of op3AA and op1ZA.

Now I was once a transmitting amateur, and I rejoiced in my ability to copy 25 words a minute and send with a good clean fist. That was thirteen years ago. From 1915 to 1926 I was out of it, having spent the intervening years in acquiring a degree or two, a commission in the Army as my father did before me, a wife, and a pair of noisy progeny. Then I encountered Mickey Doran (of KUDG) who after spending most of his day handling ship traffic for the West Jester, spent the rest of it throwing signals about the world with a Japanese 30 watter on 40 meters.

Sez I to myself, "Verily this darn glass bottle is some different from my old one Kw., but if all these cards are to be believed, it produces the goods. Verily, I will investigate." So before Doran sailed from Zamboanga, where I was hibernating at the time, I secured from him a diagram and much good advice. Now Zambo sits down below the seventh parallel near the far end of nowhere, and radio stores are not, so much junk went into my set.

Try sometime and build yourself a set with condensers cut from scraps of zinc and aluminum with a pair of tinsnips. Just try and make those condensers variable. Open up your wife's electric iron and make a grid leak of its innards. Hold down the job you're being paid for, spend your spare time with a company of native troops chasing renegade Moros in the hills, shove the thermometer up to 120 in the shade, solve your own problems, because there will be no one to answer questions, and when you get through, you will either be crazy or have a radio set. I had a set of sorts. It worked after a fashion, but not often enough to give me a real thrill—furthermore, it had made me most unpopular with my wife. She was very much "again' it," so I decided radio was not for me.

Then a mosquito bit me and a kind headquarters sent me to the mountain country to get the malaria bugs out of my system. I rambled about the hills and in the course of my wanderings, came upon a small shack between two tall lattice-work masts. "Here" said I, "is the den of a radio bug." The bug was at home and he showed me the works.

"This is op3AA," sed he. "With a 5 watter this station has worked England, and with a pair of fifties, I have made myself a member of the WAC Club. Look it over." I did. There were no loose wires. All was laid out with care and precision. Connections were made with heavy copper tubing, and that tubing was polished till it glistened. Much pyrex was in evidence, and all four walls were plastered with cards which said, not "tnx fer card, om" but "ur station wkd" or "ur station hrd wrking".

"So," I sed to myself, "I have come to the right place, but will this egg deign to notice me when he learns that I can no longer handle 25 per, nor yet even 5 per—that I have a fist like a truck, and that most of this layout means nothing to me. However, I will give it a try." So I sed, "I would have a radio station, and I have tried hard, cussed much, and burned my fingers many times with high voltage DC and with soldering irons, yet still I have no radio station. What is all this about, and what are all these pretty glass and copper dinguses for?"

Then this ham (he does not like that word) took me in hand and introduced me to the mysteries of the Hartley circuit, and the Tuned Grid and Plate and, after struggling mightily with the density of my ignorance, dug down into the depths of his junk box and presented me with many dingbats which I carried proudly home to the despair of my wife.

Now 3AA is a busy man, and he went away to Manila for two weeks. When he came back I was in bed, having been laid low again by the black water fever I had acquired in the swamps of the Southlands; and in bed with me were wire, and solder and dingbats galore. So he hied him away to his station and returned shortly with his own soldering iron and a vernier dial, and we put the finishing touches to a receiver. That night we tried it out and it worked, and great was my joy as I had expended many hours and some pesos on its construction. "Now," sed 3AA, "you need a transmitter, and while my own ambitions run to one Kw. water-cooled tubes, I think a pair of UX210's self rectified, will be about right for you to start with. Tubes are expensive, but a friend of mine is a friend of a friend, etc., etc.—so we will get those tubes cheap." We did, also condensers and things, some that we bought and some that 3AA donated out of the kindness of his heart and his hope that another good ham might be born. And meanwhile this busy ham brought out an ancient buzzer and key, and endeavored to delve into the recesses of my rusty brain and revive a ready understanding of the mysteries of dah-dit-dah.

So well did he do all this that in due time the authorities invested me with beautiful certificates, two of them, attesting my right to own a radio station and to run one. Then came the great day when a carefully measured length of No. 12 enamel was raised for all to see, and with a wavemter (3AA's, of course) in hand, we pressed the key, while Elser tinkered with the clips and dials. The needle slowly crawled up the dial and finally rested on 9/10 amp. The wavemeter said 38 flat.

"'Tis well," sez 3AA, "we will now communicate." We did. Op1HR came back at the first call "r7 stedy smooth rac", sez he. HR has become an old story since then, traffic runs smoothly to stations on the Pacific Coast. Australia, South Africa and Europe have admitted that 3AB is on the air, and great is the peace of my mind and the content of my soul. And also—Elser and op3AA can have my shirt or my wavemeter or anything else that I have any time he wants it.

In his article, he attempted to describe the wrong kind of ham. This is my attempt to tell you of his kind and of the manner in which he practices the creed he preaches, and to express my own appreciation of the assistance and friendship of a real "Transmitting Amateur". He taught me the why and wherefore of my set and helped me build it. When I've been disgusted because I had such a rotten fist and because I had to say QTA and QSZ so often, he has said, "Sure you are an awful ham, but so are we all at first. Here let me take that key and shift some of your traffic, you'll feel better after awhile."

Next year he will be in Boston Tech, splitting the ether with a pair of crystal controlled 1Kw. water-cooled babies. Listen for him and when he comes on the air, you will meet an amateur who can and will handle traffic with the best, with a fist as smooth as cream, and one who will be always ready to help some poor devil like myself who wants to be a ham and doesn't know how. He's a real transmitting amateur and he knows his stuff.

A Friendly Challenge from 6BJX

Say, gang, since 1BIG copped that traffic trophy, the traffic figures in that H'T' ol' colyum in our dear ol' *QST* have been getting awff'ly—QRZ, shall we say? Let's have a little competition here. Yours truly is going to give a few figures, and he's issuing a friendly challenge to any of you to equal them for consistency, at any time, past or future, for a like period of time. In fact, he'll give a genuine "Baguio Set" (Philippine linen, made by the natives) to whoever can prove to have equalled this record. They're all the rage om, and very scarce in this part of the world. Will one of 'em make the YL open her eyes? Oh, boy! This competition is for *operators*, not stations.

Here are the figures to shoot at, ob. In the summer of 1924, "KH" of 6BJX adopted the slogan "6BJX for a real qsr". He's tried to live up to it, and here's what he's done, from January, 1926, to May, 1927—17 months. He was in the BPL 15 times. One miss because he was sick, and one because the report was lost in the mail—and these figures are from *QST*, so we can't count that one. He handled 4849 messages, and delivered 1375. This is an average of 323 a month, and 91 a month delivered. The total only dropped below 225 twice. 6BJX was third or under on the list on six different occasions, and held the starred rectangle once. The daily schedule with op1HR is in its 19th month, and going strong. About 80% of all messages are handled with the Philippines. These average 33 words each.

To simplify matters, all we'll ask for is a like percentage of times in the BPL, with an average of 300 or over a month, and a sked—over any distance—of like duration. 6BJX has done it. Who wants that "Baguio Set"?

Some Considerations in Organizing a Radio Club

By J. Walter Frates, 6CZR

DURING January a group of amateurs from the East Bay Section met at the home of J. H. MacLafferty, Jr., 6RJ appointed him as Temporary Chairman, designated ourselves charter members and organized the Oakland Radio Club.

Our object, to quote from our new constitution, "shall be the bringing together of licensed transmitting amateurs and those interested in the art of radio telegraphy.....and further..... to encourage good operating procedure in accordance with Government regulations and the creation of a body of skilled operators whose services and abilities will further the general knowledge of the art of radio." In other words, we took the tried and true A.R.R.L. principles—or what we conceived them to be—and applied them to our own case.

Our next move was to elect officers and draw up a constitution.* Those elected as officers of the Oakland Radio Club were 6ZX, president; 6RJ, vice-president; 6AEA, secretary; 6OC, treasurer; 6CZR, publicity manager, and 6RJ, 6APA, 6CCT, and 6AMO, members of the advisory board. The third step was to apply for affiliation with the A.R.R.L.

We divided our membership into three classes: full, associate and honorary. Full members** are those who hold Government licenses. Associates are those broadcast listeners who are interested in radio telegraphy and express a desire to enter the club. Honorary members include outstanding figures in the radio game, and amateurs of other cities who would like to come in with us occasionally and sit by the fire. The inspectors of the Sixth District and 6CBJ of Santa Barbara. 6RJ, 6JS and 6ANE were appointed a committee to draft the constitution and by-laws of our new organization. 6APA, 6CCT, 6BBK and 6CCK were present at the first meeting.

Some of our rulings are a little arbitrary, we admit, but we made them so to protect ourselves and keep the standards of the club and amateur radio high. We will solicit no members, but we do invite applications from those interested who will abide by the ideals associated with the A.R.R.L. and transmitting amateurs. In addition, we reserve the right by vote of the entire club, to decide whether or not we want a man for a member, or, after being admitted, to compel him for just cause at an announced general meeting of the whole club to cancel his membership, even if he is an officer. Neither the president nor the vice president nor the members of the advisory board may hold consecutive terms of office. There will be no politics and no group can ever gain control of the club; we have arranged everything to the best of our modest abilities so that the organization will always remain democratic and controlled by the wishes of the entire membership. In addition, we have pledged ourselves for everything which will benefit amateur radio, or increase our own knowledge of the art of brasspounding.

As soon as we get straightened out in a parliamentary way, we have many plans. We're going to have a shack with a stove (not the QRM kind), a transmitter, talks by experts,*** hamfests, meetings with other clubs, discussions, code classes for beginners, banquets,—anything and everything that a good club should have.

But, while doing all this, we're not going to forget that there are other fellows both inside and outside of amateur radio worth knowing and that while entertainment is pleasant, the only reason for the existence of the art is education, instruction, operation and experimentation. And, as far as we are concerned, that's the way its going to be, or they can't' play in our backyard!

*Any one interested in organizing a radio club may obtain a sample club constitution by requesting the same from A.R.R.L. Headquarters to help the committee appointed in drafting a satisfactory set of by-laws.—F. E. H.

**By restricting full membership and voting privileges to qualified transmitting amateurs, the founders of the club can rest assured that its government and objectives will always be devoted to amateur two-way communication in accordance with the Constitution and By-Laws. This is an important provision which should be carefully considered when a club is being organized.—F. E. H.

***A program committee arrangement that has worked very successfully with several clubs is that of making the committee consist of two men plus the president. The two men divide their duties clearly and are required to report a definitedate each month (to the president) on the program that has been prepared. When the men on the committee are changed but one goes out of office at a time.—F. E. H.

With the Route Managers

By Lawrence A. Jones*

WHAT seems to be the main difficulty, fellows? Here the number of Route Managers is increasing all the time, and yet the number of letters is decreasing. That isn't at all according to Hoyle. By rights we should be snowed under with epistles from you.

Summer wx and summer traffic are with us for sure now. Messages are scarcer than hen's teeth, and many stations have canceled their heretofore reliable schedules. It's too bad, but that's what we have to contend with every summer. Perhaps it's just human nature to want to drop all winter activities in this weather, and get out in the fresh air. We all feel that way, but surely there isn't any reason why one evening a week—or even part of it—cannot be devoted to schedule work right through the hot months.

1AAL, RM of Western Mass., says, "This sure has been a tough month for QRN. At times it was next to impossible to work on eighty meters. It did not bother me so much though, as I put one over on it by going down to twenty meters. Have handled a good deal of traffic down there." He's right, fellows. When the static gets too bad on eighty, just try popping down to twenty for a time. Brown also tells us about the official opening of the message box system in his city. The Mayor of Worcetser was induced to post the first message, which was addressed to the Mayor of Hartford, Conn. The message was relayed immediately through Brown's station 1AAL to 1MK, phoned to the Mayor of Hartford, and a reply immediately relayed back to Worcester. The whole business occupied less than half an hour, and was a fitting opening for the box system. FB work, OMs! 1APL in Springfield has been appointed as Brown's assistant in RM work, and we are sure he will do a good job. Good luck to you, OM.

9CWN, the new RM of Northern Minn., is getting off to a fine start in his work. He has gotten out a multigraphed letter to all his ORS, asking for their cooperation in keeping him advised of schedules, etc. Among other things this letter contains spaces to fill in giving wavelengths, times, direction of easiest QSO, etc. That's the stuff, old boy, keep at 'em. Let's hear how the thing works out.

4FI, our worker from Tennessee, says, "I have a number of stations who say they will be active 'a little later', but it looks like this 'little later' is never coming to pass, so I'm going to 'ride 'em Cowboy' until I see some active stations in Tenn." With a spirit like that, results just can't help coming. 4FI also tells us that since Tennessee has a comparatively small number of ORS, he is going after the non-ORS and trying to get them to apply for an ORS ticket and handle more traffic. We expect to hear great things from Tenn. with that kind of work going on. Congratulations OM, and keep up the good work.

We have another comment on the QRN situation from F. J. Beck, the SCM of South Dakota. He says that QRN has sure been knocking things in his section, and he suggests a remedy in maintaining skeds on twenty meters plus forty and eighty short distance daylight schedules to clear local traffic. Beck tells us that twenty meter traffic is improving FB. It won't be long before the gang as a whole will realize the excellent traffic handling possibilities on twenty and begin to make use of them. As we have told you many times before, static is practically nil down there on nights when it is knocking your heads off on eighty and forty. Give it a try some day, by starting some messages on their way.

Our old friend 9CZC of Iowa, says that although the ORS do not seem very active, there is some traffic being handled on the sly. Hi! Appearances are often deceiving! Anyhow whadda we care just so long as it's being handled? He also tells us that many stations are sticking to eighty meters, and can be heard

* Asst. to the Communications Manager.

and worked nightly even in this warm weather. So you see fellows, that it can be done. The static *is* bad, but we should not give up the ghost until it becomes absolutely impossible to work through.

Lookit gang, we're squeezed into half a page of *QST* this month, and it's all your fault. If you are interested in reading this stuff, you'll have to contribute some yourself. Depending on the other fellow will work for a while, but not forever. So every one of you write in this month, and we'll see if we can't get back our full page next time. Incidentally we would be mighty interested to know how many of you read this page, and whether or not you like it. Drop a QSL card in the mail box as soon as you finish reading this and tell us all about it.

That's all there is now. Best of luck for another month. 73 de "LJ".

Reports on 20-Meter Work

WHILE early May reports indicated generally poor conditions for a few days, most of those received during late May and early June showed a return to the previous fine conditions. During the international tests a whole new bunch of foreign stations were heard and worked on "20". The most successful stations in the tests used 20-meters in addition to other wavelengths. Many good logs of work on "20" alone were received. Of course stations capable of a quick QSY had a material advantage in that they could make *best* use of all available operating time. Lots of operators found relief from 40-meter QRN and QRM by working the large number of 20-meter brass-pounders who were "QRV test msg". Low-power stations found themselves under no handicap at all using "20".

From 1AJM, "Out of 23 countries heard on 20, I have worked 22. Traffic is now better, too. Took a msg from nu6VZ for ei1AY, gave it to him an hour later and had answer for 6VZ same night. xLWJ can't give full QRA but he is operating under cover from some point in India, QRH 19.8 meters, DC note, and will QSL those worked when possible."

20-meter calls heard by 8AXA (Syracuse, N. Y.) May 9-22: eb 4AA 4AU 4BC 4WW 4ZZ, ef 8BF 8CT 8EO 8FJ 8GM 8JJ 8JM 8JN 8NOX 8TUV 8YOR, eg 2AO 2CC 2IT 2LZ 2XY 5BY 5GQ 5HS 5LS 5WQ 5YK 5YX 6BD 6MU 6YV, ei 1CO 1CR 1NO, em SMUK SMWS, en PB6, fm XN2, oa 2UK 7CW, oh 6BDL, oz 2AC, sb 1AC 1AD 1AK, sc 2AH 2AR 3AG, su 1CD 2AK.

6CKV (San Jose, Calif.) reports, "20-meter work is increasing out here. All continents have been worked on that band. Stations dead to Europe on 40-meters are getting R-8 and R-9 reports from there on 20....honestly it can't be beat. Am keeping daily schedule with amVS1AB (Singapore, Malaya) and we work single from 1500 to about 1630 Greenwich. amVS1AB is just below WIK with a deep RAC note and vy steady. It's great to send away single and know the fellow 9,000 miles away is getting it perfect, and then look out the window and see a bright sun (it's mid-morning) !" A message from amVS1AB to Hq via 6CKV and 4FA made good time on 20-meters. Tnx. OMs.

From 8AVB via 1LU and 1BHW, "Have been on twenty meters for over three months. Have worked about 65 different sixes and about 15 different sevens and nc, np, oh, ef, and WIY on UX210. Have found 20 both peculiar and FB at times." From 3CVQ, "Worked eg5HS from 5 to 5.30 pm EST May 14.... our sigs R5."

A word from 1BYV (Framingham Center, Mass.), fmTUN2 at Tunis, Africa, has been worked five times lately between 2000 and 2400 Greenwich, sometimes later. He uses AC plate supply, 30-watts input on 23-meters, and asks the gang to look for him. The 20-band is perking fine now, as I can figure over 25 countries represented. Worked 6HM the other night when he had but 9 watts input in his set, also worked eg5YX ten times and he generally uses less than 10 watts. FB!"

From nc3FC (Toronto, Ont.), "Wholly from choice I used 19.85 meters with T.P.T.G. circuit, operating from eleven pm until one am daily during the Contest. A Sunday schedule with eg5HS has been in effect for many months and his signals are remarkably steady and R6 or better. The time has gradually been set ahead from 1800 to 2130 Greenwich. What I regard as most outstanding on this wave is the work with oz2AC night after night begun last March and carried out regularly ever since. oa7CW, oh6AXW, oh6BDL, eg5BY, eg2IT and ef8CT put good signals through during the tests."

record time on 20-meters, being relayed via oh6BDL, nu5WZ, and nu1BCZ. A shorter message from the same station of origin was received through nu6BIH, "20-meters sure is the DX-wave. May 23 0700 hooked with eb4AU position here 12.07 S. 142.10 W. QRB 9360 miles."

A radiogram from CR10 to Headquarters made egBRS63 "finds 20 meters FB and logged oh6AXW, oh6BDL, na7MN, nu6ZAT, nu6FR, nu6UR and many others in other districts during the first week of May. 20-meter work is jolly interesting because there is so much to be found out."

nu6VZ (Santa Monica, Calif.), "....was QSO ei1AY on 20 meters at 10.40 pm PST May 29, 1927. Is this the first Italy to Calif. QSO on 20-meters?" It's the only one ever reported to us, OM. 6BQ, 6AJM 6BAM, 6AXU, 6CNK and 6LH are now on 20-meters and 6SB expects to QSY soon. 6ZAT (Bill Eitel, Los Gatos, Cal.) has worked 19 countries to date on "20". His station is one of the best points for So. African contact at present and has been QSO 114 times since last Sept. 12 (about every other day!). Not always on 20-meters of course though the latest QSO reported is contact with foA4F on "20" April 29. 6ZAT says that the South African fellows are bashful about coming down to 20-meters for some reason and passes along the rumor that A5O is planning to move to Bermuda. Sec'y Raymond Coombs of the South African Radio Relay League sends news that a 20-meter contest with English hams is being planned.

8CLP reports his best DX the sixth district until he dropped from 40 to 20-meters. Now he has worked nm, np, nj, nr, sb, ef, ei and oa, the latter QSO being with 4BD. He says, "oh, oa, and oz stations are good until about 3.00 am EST, then fade gradually out. All the Toledo, Ohio gang are now on "20" exclusively. The strongest and most consistent are as follows: ef8CT, 8BF, eg2IT, oh6ACG, 6AXW, 6BDL, sb1AK, su2AK, sc3AG, oz2AC."

Fred Westervelt, 8VE (Pittsburgh, Pa.), "I tried to raise So. America for a long time and never succeeded until 20-meters came to the rescue. That band is a GOOD band for EVERYTHING. Herewith a list of 20-m calls heard (Apr. 15-May 15 in spare moments):

4CJ, 4FA, 4SI, 5AFB, 5AKO, 5AMW, 5API, 5APZ, 5AQE, 5AQU, 5QJ, 5SK, 5UK, 5WZ, 6AGS, 6AHS, 6ARY, 6BAM, 6BUX, 6CHE, 6CKV, 6CUC, 6DCK, 6DFE, 6DGQ, 6EA, 6EW, 6RN, 6TX, 6VZ, 6ZAT, 7BM, 7DA, 7EK, 7GB, 7HX, 7JF, 7MH, 9AEX, 9AOK, 9AYW, 9BCN, 9BGH, 9BOC, 9BYC, 9BYL, 9CAA, 9CKI, 9CVN, 9DBV, 9DKR, 9EK, 9KV, eb-4AU, eb-4AX, eb-4WW, ef-8BF, ef-8CT, ef-8YOR, eg-2IT, eg-2LZ, eg-2NH, eg-5BY, eg-5HS, eg-5YK, ei-1CA, nc-1AR, nc-1BY, nc-3GG, nc-4DU, nc-4FV, nc-5BF, nj-2PZ, nm-1AA, np-4SA, oz-2AC, sb-1AD, sb-1AK, sb-1AW, sb-1AX, sc-3AG."

Bill Duffield, nc4DU, (Winnipeg, Can.), "On 20-meters I have been QSO eg5YX, oh6BDL, sc3AG, oa, oz and CHAM (the S.S. Seaham when 100 miles west of Ireland) to whom cards may be forwarded via nc2CG. I beg to differ with nu8CCQ's statement in last *QST*. For a year I have been using both WE211D's and 212D's on 20-meters having worked the latter tube as low as 15 meters with inputs up to 400 watts. I find that smaller grid and plate blocking condensers are better with the WE212D when used below 25 meters (.0003 µf.). Have logged eg2LZ 2OD 2NM 5BY 5YX 5HS 2IT, eb 4AU 4AX 4WW 4ZZ, ef 8YOR 8CT 8JN 8JJ, sc 2AH, 3AG, oh 6BDL 6AYW, oz2AC, oa4BD, CR10, CHAM, GLGY, NIDK."

Mr. J. C. Haban, Columbus, Ohio (8BJF) is studying 20-meter polarization effects by making daily observations on GLQ, FW, and AGB (26 meters and approx. 4,000 miles distant) and on 2XT (17 meters —500 miles) with a vertical and a horizontal antenna at certain hours. Between seven and eight pm EST signals from stations in the first group pick up strength rapidly using a horizontal receiving antenna while 2XT's strength is unchanged. Audibility is nearly constant from all stations observed using a long high antenna with quite great vertical length. More volunteer observers are wanted on this problem. All that's necessary is a good receiver and horizontal and vertical antennas of about the same over all dimensions with switches for quick changeover. Observations over a period of several days should be averaged. PCUU and WIK right in the vicinty of

20-meters are a couple more good stations on which to make observations.

7BM finds twenty meters "the berries" as he worked all districts but the third in two hours time. 9EF says. "I have worked five continents in one night on "20". fmTUN2 has been worked twice....QRA Radio Club of Bizerte, P. O. Box 72, Bizerte, Tunis, Africa. A Spanish whaler X2R has been worked by 9BSK and myself when about 2000 miles southeast of Cape Ste. Marie, Madagascar QRD the antarctic. X2R asks all the gang to look for him on "20". 1AKZ is having good luck with So. America on 20. 6FR says, "It seems to be the best wave for both European and Australian QSO's. 1AAL says there is plenty of traffic on 20. 9EAY handles most of his traffic there now. 1AJM is on 20 to stay. Victor Gramich, Murnau, Oberbayern, Germany (ek4UAH) says in speaking of 20-meters. "Tests I have made till now persuaded me the work is very satisfying and this band is the coming band for DX work. The May 23 and 24 I have worked on "20" in a few hours the following stations: nu1RF (the first nu-ek QSO on "20"), nu4RR, nu2TP, nu1AJM, nu2CH, nc3MP, nc9BZ, sc2AH. The last one reported me R5 though using but 20-watts input on this wave. On my first test on April 10 I picked up immediately foA5X."

Notice

During the past month three Section Managers have taken office. They are as follows: In the Oregon Section of the Northwestern Division, R. H. Wright, 7PP, 310 Ross St., Portland, Ore. In the San Francisco Section of the Pacific Division, J. W. Patterson, 6VR, 1338 Fell St., San Francisco, Cal. In the Sacremento Valley Section of the Pacific Division, C. F. Mason, 6CBS, 2530 N. St., Sacremento, Cal. Give them your cooperation in all they are attempting for these Sections of A.R.R.L. please.

This month we are sorry to be obliged to record the resignation of S. C. Ms in the Eastern New York Section of the Hudson Division, in the Michigan Section of the Central Division and in the Florida Section of the Southeastern Division. To OMs Peacox, Darr, and Grogan go all good wishes from the gang. Probably when they are relieved of the load we will hear them on the air more th~n was possible when busy with Section affairs.

Due to these resignations and to vacancies in our line-up previously existing, *nominating petitions for Section Communications Managers are hereby solicited from the following Sections:*

Section	Petitions to be valid must be filed on or before
Eastern New York	Noon, Aug. 2, 1927
Michigan	Noon, Aug. 2, 1927
Florida	Noon, Aug. 2, 1927
Alaska	Noon, Aug. 2, 1927
Montana	Noon, Aug. 2, 1927
Washington	Noon, Aug. 2, 1927
New Mexico	Noon, Aug. 2, 1927

The closing dates for receipt of nominating petitions in the Sections listed is given above either as previously announced or extended when necessary due to the failure of members in filing petitions in certain Sections. Petition must be filed at A.R.R.L. Headquarters on or before the time announced to be valid. The proper form for nomination was shown on page 45 of April 1926 QST. The candidate and five signers of a nominating petition for Section Communications Manager must be members of the A.R.R.L. in good standing and the signatures on the petition must be authentic or the petition will be thrown out as invalid. Members are urged to take initiative immediately, filing petitions for the officials of each Section now operating under temporary officials, so that the work of organization can go forward everywhere without further delay.

—F. E. HANDY, Communications Manager.

OFFICIAL BROADCASTING STATIONS

Changes and Additions
(Local Standard Time)

9JU (41.5) 10:15 pm Tues., Fri.

3ZI-3CS (81) 7:00 pm Mon., Thurs., Sun.

5ADA (41) 7.00 pm Sun.

BRASS POUNDERS' LEAGUE

Call	Orig.	Del.	Rel.	Total
8BAU	41	27	339	407
9CPM	15	147	218	380
6AMM	69	140	140	349
6BJX	86	120	77	283
8XE	37	34	207	278
op1HR	—	—	—	226
3BLP	1	6	210	217
2APD	34	36	142	212
8CWT	18	42	138	198
8EU	41	36	114	191
8GI	2	50	124	176
op1AU	—	—	—	175
6DAU	40	36	86	162
9CMV	85	26	40	151
8CGZ	2	3	146	151
6AGG	53	2	88	143
5AMO	30	15	90	135
6CMQ	16	11	106	133
8CXL	—	—	131	131
8AVK	26	20	84	130
7UL	112	1	16	129
1APL	4	16	107	127
9BWN	30	20	74	124
1BQD	27	—	97	124
1AOX	19	7	98	124
2ALP	27	34	62	123
5EW-5PK	96	16	11	123
6ZBJ	11	7	104	122
5FJ	43	17	58	118
6RJ	19	29	66	114
6BWV	7	7	96	110
6BYH	12	11	86	109
9DOE	27	19	60	106
9ZK	21	6	78	105
1BFZ	32	10	62	104
6BVY	49	53	—	102
6AJQ	37	24	40	101
8ADQ	75	13	12	100
8BNW	25	21	54	100

Some stations took time out for participation in the International Relay Tests; others let summer QRM their message handling activities. The B. P. L. shows the effect of these things this month, giving credit to the stations that in spite of *all* obstacles handled quantities of good messages. 8BAU, 9CPM, and 6AMM are the top-notchers with old 6BJX and 8XE in fourth and fifth place. Nearly forty stations are keeping up membership in the B. P. L. during the summer months. Others can do the same with a little more effort in making and keeping schedules with the right stations. Hw?

ARMY AMATEUR NOTES

SECOND CORPS AREA—At the Army Amateur meeting held during the recent Hudson Division Convention, Capt. A. C. Stanford and Capt. J. L. Autrey, in charge of A-A work in the Second Corps Area, Lt. D. S. Boyden, A-A Representative for the First CA, and Lt. David Talley, A-A Representative for the Second CA, were present. Interesting talks were given by each, and the value of A-A stations was officially recognized by the commanding general. The officially recognized by the commanding general. Stations keeping schedules with 2SC are: 2OU, 8HJ, 2ASE, 2AVB, 2CVJ, 2PF, 3HW, and 2EV. A-A stations 2APD, 2AVR, 2ARM, 2CBC, 8DME, 8CVJ, 2ALS, and 2CZR continue to be active.

THIRD CORPS AREA—Station 8AGO has been in communication with Captain R. C. Hildreth, S.C., who is to represent the Third Corps Area at the Atlantic Division Convention. Station 3BQJ has been doing satisfactory work in keeping schedules with 3SN. More A.R.R.L. members are desired in this Area. Amateurs interested are requested to communicate with the Signal Officer, Headquarters Third Corps Area, Baltimore, Md., for details.

FOURTH CORPS AREA—Certificate has been issued to 4BZ of Atlanta, Ga., to serve as principle of the 122nd Infantry, Georgia National Guard. 4SI has been acting as Corps Area Control Station, and will continue to do so, meeting all schedules with 2CXL, indefinitely.

EIGHTH CORPS AREA—Station 5AIN, the N. C. S., has been operating satisfactorily. Tests have been carried on from this station for the benefit of A-A stations in Arizona, with satisfactory results.

Club Activities

ALBERTA — The Alberta Radio Experimenters' Association at Calgary, is doing good work. They hope to have a new station in operation shortly, and expect to handle traffic. FB!

BRITISH COLUMBIA—The British Columbia Amateur Radio Association, Inc., has held its first hamfest. Being in Canada, trips to the liquor store were not infrequent. Hi! The members donated enough apparatus of various kinds so that the club will be enabled to get on the air with a real high-powered station before long. FB. More of these meetings will be held in the near future.

CALIFORNIA—The Central California Radio Club have engaged their new club rooms, and expect to hold open house soon. They propose to have code classes and general instruction in amateur work as soon as they get located.

The Oakland Radio Club has been making several attempts to QSO Sokoloff of na7KK, in response to a request from Headquarters. FB!

The Santa Clara Amateur Radio Association is starting construction of their new high power transmitter. Visiting amateurs are always welcome to the clubrooms.

The Silver Gate Radio Amateur Association are having very interesting meetings, and the club now numbers fifty. They held a very enjoyable banquet a while ago.

The Whittier Union High School Radio Club put over a hamfest attended by 100 Southern Calif. hams. 6CSS, 6BMA, 6AM, 6BUR, 6DDO, and 6BKA were on the program. 6ALZ was the manager. YLs 6EI and 6BXA both graced the gathering with their presence. Of course everyone had a peach of a time.

CONNECTICUT—The Twin City Radio Club of West Haven elected 1ATH as their new president, to succeed 1BAU, who resigned.

GEORGIA—The Chattahoochee Valley Radio Club has just been organized for the purpose of helping local amateurs and BCLs by giving them the opportunity of getting together with their problems.

IDAHO—The Idaho Key Pushers, known as the IKP, is a new organization started to promote and uphold interest in amateur radio in the state of Idaho, and to help the A.R.R.L. put across any worthwhile proposition. Any interested Idaho amateurs are asked to communicate with SCM Fletcher, 7ST.

ILLINOIS—The Chicago Radio Traffic Association plans to continue activities right through the summer. They are organizing an indoor baseball team, which will get into action as soon as the rainy season passes. FB!

The Aurora Amateur Radio Club is a new organization which has 9EHF as its president, and 9NE as its Secretary-Treasurer. The main purpose of the club is to protect the amateur, and to give some instruction in theory and code.

INDIANA—The Purdue Lafayette Radio Association has been organized at West Lafayette to further the interests of the amateurs at the University. A hamfest was held recently, and was so enjoyable that more are to come darned soon!

The Indianapolis Radio Club is starting a code school for beginners. The vice-president, 9DSC, has an iron brand with which he intends to mark all chairs, etc., in the club room, so that said chairs will not walk away when left alone. Hi!

The Mahoning Valley Amateur Radio Club holds contests for code efficiency for the young members every three months. The first one to pass license exam gets a UX 210. That's an FB idea!

The Society of Rochester Transmitting Amateurs is busy arranging for the big annual western and central New York Convention at Rochester August fifth and sixth.

KANSAS—The Imperial Brass Pounders Club of Independence, of which 9BUY and 9JU are the officers is going along in fine shape. Meetings are only held about every four months, due to the large area covered by the club's membership. The purpose of the club is to promote better friendship among the hams of southeastern Kansas.

MAINE—The Queen City Radio Club is deriving a great deal of enjoyment from bi-weekly gatherings at various members' homes. Plans are under way for a week-end trip to the sea shore in the latter part of June, and it is hoped that the Bar Harbor gang will ring in on this with the Queen City bunch.

MASSACHUSETTS — The Eastern Massachusetts Amateur Radio Association meets the first and third Tuesdays of each month, at 72 Gardner St., Allston, Mass. Interesting technical talks and discussions are held at the meetings. New hams are always welcome.

MISSOURI—Chapter 3 of the O.B.P. has been founded at this city. The order of O.B.P. is a semi-secret body working along the lines of college fraternities, and composed of bonafide active operators. 9ZD, 9ADR, 9ACA, and 9DRD are the officers of Chapter 3. The aim of the O.B.P. is to foster a fraternal spirit among amateurs in a way that stimulates attendance and interest at each meeting. It might be interesting to other cities to investigate the order of O.B.P. with the possibility of organizing additional chapters. Chapter 1 is affiliated with the A.R.R.L.

NEW YORK—The Queens Radio Club will be on the air shortly with two 210's. The club's operators will take turns at keeping schedules with reliable stations.

OHIO—On April 22, the Cleveland Amateur Radio Association visited the local telephone company, and heard an interesting talk on "The Dangers and Effects of High Frequency."

ONTARIO—The Telephone City Radio Association of Brantford has installed a couple of receiving outfits in a local sanitorium, equipping them with three loudspeakers and about 55 headsets. The club is also active in clearing up interference sources. FB, fellows. Such work is bound to be appreciated, and it would be well if more clubs would undertake such work.

PENNSYLVANIA—The Golden Triangle Radio Association has an idea that may be useful to some of the clubs. They have no regular elected president. They nominate a member at each meeting to preside, thereby being the acting president for the evening. This is done so that no one can say it is a one man club.

SASKATCHEWAN—The Moose Jaw Radio Association has been affiliated with the A.R.R.L. They operate a broadcasting station under the call 10-AB, and intend to preach ham gospel over the air. At present they are conducting a drive to secure sufficient funds in order that a good radio set with phones for every bed may be installed in the general hospital, and are having good success. That's a fine idea, and the club is to be congratulated.

WEST VIRGINIA—On May 2, the Gamma chapter of the Pi Alpha Tau Amateur Fraternity held a meeting, at which 4KF was initiated. 8BSU, 8ASE, 8CDV, 8DOH, and 4KF were present.

WISCONSIN—The Milwaukee Radio Amateurs' Club publishes an interesting paper called the "Badger News." It is edited by 9VD.

TRAFFIC BRIEFS

8BFA says that a 100-watt toy transformer makes a good plate transformer for a transmitting outfit, that is, *when one has 500 cycle ac available.* He feeds about 150 volts of 500 cycle stuff into the 25-volt (60 cycle) winding of the transformer, and gets enough out of the 110-volt winding to make a UX 210 blush. Of course, the insulation of such a transformer will hardly be good enough to stand more than five or six hundred volts. It looks like a peach of an idea for low power tubes, though.

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9DCX says, "There are only two men that got a crystal oscillating within a half hour—One is dead, and the other went crazy.—*QTK.*

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While the yacht *Fortuna* was cruising in the Gulf of Mexico, the Atlantic Coast Line RR tried in vain to get in touch with the owner in order to advise him that the departing time of the train on which he was to leave Ft. Myers had been changed. Finally, the General Agent of the RR came to 4QY and asked if he could help out. Since 4QY had a schedule with the boat it became a simple matter. Good work! Incidentally, 4QY tells us that the General Agent is sold completely on amateur radio. Hi!

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6ABN says that twenty meters and the checker plan of 6DEG described in *QST* are both the berries. He played an entire game of checkers on twenty with 4JI, and has worked lots of DX besides.

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9ADB says, "My Chev. has a low frequency note cuz I can count the cycles."—*QTK.*

DIVISIONAL REPORTS

ATLANTIC DIVISION

DELAWARE*—MARYLAND—DIST. OF COLUMBIA—SCM, A. B. Goodall, 3AB—Maryland: 3CGC is active on 20 and 40 meters. 3HI has been heard fairly regularly with good signal strength. 3LL is putting in crystal control. 3HG is still working the foreign fellows and getting a kick out of it. 3RF, who has been consistent in the ham game, has had to close down. 3BCK is "somewhere in 200". 3CFX is operating a very low power set with battery supply but is doing nicely with traffic work. 3CV is a new station on the air with schedules and getting out in fine shape.

Dist. of Columbia: 3BWT, RM, has cut down with his schedules and taking a partial vacation from the strenuous work he has done in the past. 3GP is still pounding away consistently with a crystal controlled station in the 40 meter band. 3ASO, another crystal control station, has at last dropped down to 80 meters and is heard evenings. 3ALF is on 40 meters with low power. 3AB is only on the job for short schedules in the early evening. 3CAB is on the air regularly when at home.

Traffic: 3CAB 16, 3AB 15, 3BWT 25, 3GP 41, 3CGC 6.

EASTERN PENNSYLVANIA—SCM, H. M. Walleze, 8BQ—The traffic figures are poor this month. Practically every report is late. QRN is blamed by many for the low totals. Others had other work. 20 meters is taking its toll. Early morning hours seem infested with beginners who don't QSR. The man with regular skeds handles the *real* tfc.

8EU tops the list, handling a lot of convention tfc. 8CW is busy on 20 but says tfc is poor. The R.I. fixed 8BFE up with a new license. 8CMO is DXing on 40 but did fast QSRing with KFZG to NYC, 20 hours. 8CHZ continues with FB work. Tubes left for 3AIY. Tfc. was good for 8AVK. A new Hertz steps FB for 3BLP. 8ADQ is on 40 for a change. 3ADE is working three bands with success. These fellows are always on top. They find traffic anywhere. A new cage is giving 3HD trouble. Local QRM gave 3CDS trouble. A new op at 3LM's shack gummed the total. 3ZM flopped to 40 again. Power leaks played thunder with 3NP. 8AVL has an 852 on 10 m. 40 m. has 3PY for the summer. 3BUV sticks to 40. 3HH is working for an ORS appointment and is doing nice traffic work on 80. 3CJN hit it up nicely this month. 3ABX is out for an ORS, also. 3BQP is overworked at work. 3AKW has a new 852 but wasn't home to use it much. The R. I. visited Hazleton this month. 8RQ has a poor location. 8WJ is QSO his brother, 2WC, regularly. 8BQ 'lunched' the Inspectors. Hi!

Traffic: 3BLP 217, 8EU 191, 8CGZ 151, 8AVK 130, 8ADQ 100, 3ADE 65, 8CMO 39, 3ABX 29, 3CJN 21, 8BQ 20, 8BFE 19, 3HH 16, 3AIY 14, 3HD 13, 8CW 12, 3CDS 11, 3NP 11, 8AVL 11, 3AKW 5, 3BQP 5, 3PY 5, 3LM 4, 3ZM 3, 3BUV 1.

SOUTHERN NEW JERSEY—SCM, H. W. Denshom, 3EH—Despite recent discoveries and developments in the .77, 5 and 20 meter bands, in television, etc., it seems the old annual slump is with us again. Looking back over the past few months form reports, the experimental interest in amateur radio is conspicuously absent from the items of general interest. What do you say, if on future form 1 reports we include a report of what we have been playing around with for the last month. Give this dope to the SCM on your monthly reports, if the form one is not big enough use a separate sheet. 3CO thought he could give up ham radio. It can't be done. 3ZI has his antenna in the air again. This time on a copper spout mast and is perking away on 76 meters. 3CFG is running skeds with 1PE, 2AFV and 8AVK. 3SJ has been feeding his antenna on 20 meters on a voltage point and wondering why no DX. Hi! 3KJ is all set to come back on the air with a W.E. 50 and M.G. 3UT has been getting good DX on twenty with a vertical antenna. 3AAL sold his automobile for fifteen dollars so he could buy a new UX210.

Traffic: 3CFG 70, 3SJ 21, 3KJ 1, 3UT 32.

WESTERN PENNA.—SCM, G. L. Crossley, 8XE—Reports this month are very small. 8BRM will be off the air for a while because of special circumstances that happen to most of us. It is reported that he is to be married soon and the better half is not an opr. 8DKS, 8AYH and 8CRK are QRW. 8ABW will be inactive for the summer. 8AGO and 8CEO report the Atlantic Division is going to be a good one and they are very busy with that work. 8CES has been in continuous operation since 1922 and still going strong. 8DOQ and 8AKI are on the air again. 8CES has been sick but will be on soon. 8AXM has been having transformer trouble, but is back on the air now. 8DOB is making a few changes in his set. 8CFR has been having some transformer trouble. 8DBL is putting in higher power. 8AWR and 8VE are on 20 meters. 8VE needs Asia yet to make the W.A.C. 8GI has schedules and as a result handles traffic. 8ZD is going to a new location and is going to put in a 5 and 20 meter set. 8CWT has a mercury arc on 20 meters. 8GK is on 40 meters. 8CYP wants several schedules for early evening. 8DFY mourns the loss of a 50 watter. 8BHN and 8BVG have new chemical rectifiers. 8GU is back home at Erie again. 8AMA is the new call of the Erie Radio Club. Out of 30 ORS in the section, there were only 20 who reported this month. Can't we have all of the ORS report some month?

Traffic: 8XE 278, 8CWT 198, 8GI 176, 8AGO 86, 8CEO 85, 8ABW 25, 8AKI 22, 8DBL 21, 8CFR 20, 8DFY 18, 8CYP 17, 8DKS 15, 8VE 10, 8DOQ 10, 8AGQ 6, 8GK 4, 8ARC 3, 8CES 3, 8CRK 2.

WESTERN NEW YORK—SCM, C. S. Taylor, 8PJ—We can be proud of 8ADG who hooked up with 26 foreign stations during the inter-relay tests, on both 20 and 40 meters. 8AHC also worked many foreigners. 8ANX has handled some. 8APK has handled skeds with 1DV and handled traffic. 8ARG has been handling traffic until he blew his 50 watter 8AYJ is off for the summer. 8AVR has applied for portable license as he expects to go West for the summer. 8AYU has been busy with skeds with 8DKY, 3AC, 1ASD, 2ADZ, 8APK, 8CRF and 8BMJ. 8BAG has been keeping skeds with 1AJF, 1QB and managed to handle some traffic. 8BCM kept skeds with 3NF and 1APL. 8DKX received a msg from 8DKX and got a return answer back in 5 minutes. 8BGF has been worked by 7DA. 8BLP has built a new transmitter and wants skeds with Aussies and Zedders on 40 meters. 8BMJ has two foreigners and all U. S. A. Dists. to his credit. 8BQK's YL has gone on her vacation so he would like skeds with anyone on Long Island, N. Y. 8BYE says traffic is poor. 8CDB says the gang should get on 20 with traffic. 8CNT has been handling traffic. 8CVJ broke the news of Lindbergh's trans-Atlantic success into the flooded Southern districts. 8CYK has been operating at 8CHY and 8ARS in Ohio while working there. 8DDL has handled quite a bit of newspaper traffic on the Lindbergh trans-Atlantic success. 8MU will be on the air soon at Canadaigua. 8DHX was preparing for the International Tests when his power transformer blew. 8DNE got news of Lindbergh's flight from France ten minutes before cable to U. S. A. Press, etc. 8DNE has been off the air on account of illness. 8DRJ handled quite a bit of traffic and worked oa-NM. 8HJ is with the Army Test Stations and kept skeds with 2SC, 8DME, 8CVJ, 8CPG and 8BMN. 8QB worked oa2RT. 8UL has just finished his crystal control transmitter and is handling traffic again. 8AYB of West New York is on 75 and 80 meters for schedules only.

Traffic: 8CDC 89, 8DDL 39, 8CNT 23, 8DNE 18, 8CVJ 8, 8ARG 7, 8ANX 4, 8CYK 1, 8DRJ 52, 8AHC 37, 8BQK 19, 8UL 9, 8AYU 8, 8BAG 7, 8BGN 3, 8CDB 45, 8APK 24, 8BMJ 18, 8BFG 9, 8HJ 7, 8ADG 6, 8AVJ 2.

CENTRAL DIVISION

INDIANA—SCM, D. J. Angus, 9CYQ—9BUZ worked Aussies regularly until the station was torn down for the school year. 9CIZ is operating on low power with Hertz antenna on 20 and 40 meters. 9AKK gets on once in a while on the 40 meter band with low power. 9CHC uses a 7½ watter with an indoor antenna and works all over the country with this combination. 9IY is inactive at present due to experimentation. 9CMV is the most active station near here. Twelve operators keep two fifty watt sets busy on 20 and 40 meters. 9BK and 9CEY are not very active. 9EF is doing fine work, working oa, oz, ei and many others. He just needs Asia now to become a WAC. 9DIJ is having just about as good luck with a 7½, getting R6 from France. 9BSK isn't on as much as he used to be but works out fine when he is on. 9CP will be going strong on 20 any day now. Too busy with school work since Apr. 1. 9OG expects to go to France with the American Legion. 9BBJ thinks he can get the gang going again as soon as he gets home from school. 9DLM is working

on 40 meters, even tho he got married recently. 9DUZ works fair. 9ASX is on 40 with low power occasionally. 9AUX just bought a new 50. 9ABP is moving to a different part of the city and is off temporarily. 9DHM is on the road and off the air for some time. 9AEB is on when he can find time. 9DDZ is busy with railroad work. 9BOH is the only really active station in Elkhart. 9BYI was on for only 8 days during the past month. 9DVE is getting good results with his mercury arc rectifier. 9EF made 26 points in the I.R.P. 9DUK has finished his new home. It has a radio room and he will be on the air as soon as he gets an antenna up. 9AGR with 100 watts (RAC) on 80 m. reports 4 mags. relayed. 9EG is on 41 m. with 50 watts and works flocks of hams. 9EJU has his 7½ watter on 39 m. and says it's FB. 9BEF and 9DDA have not been heard from and could not be located in this huge city.

Traffic: 9CRV 33, 9CYQ 19, 9DSC 16, 9CVX 10, 9DPJ 21, 9EJU 18, 9AXH 4, 9CUD 2, 9CLO 2, 9BKJ 5, 9CMJ 11, 9CNC 14, 9ASX 3, 9EGE 10, 9AIN 12, 9BK 6, 9EF 38, 9BBJ 12, 9AEB 10, 9AUX 6, 9BQH 4, 9BYI 4, 9DDZ 2, 9BOX 9, 9BUZ 30, 9CMV 151, 9AXO 5.

OHIO—SCM, H. C. Storck, 8BYN—Reporting was not so good this month, and some ORS have the idea they don't need to report when not actively on the air. This is a mistake as missing reports for two consecutive months is grounds for cancellation now as always. Notify your SCM that you will be off the air, so that he can know what is going on and put you on a temporarily inactive list instead of being obliged to turn in a cancellation. Traffic has taken a slump, which was expected, but the SCM expects *some* activity all thru the summer. Plenty is going on on 20 now, and those keeping schedules down there are reporting it FB for traffic. Let's get down to 20 and keep things humming thru the summer. What say? 3 stations handled 100 or more while 16 got above 10 messages, rather a poor showing for OHIO. 8BAU takes high honors again with 407 messages, 8 of which concerned Lindbergh. 8CXL (a non-ORS, by the way) comes next with 131. FB! 8BNW handled 100, 8GZ 84. 8CXL did good work handling messages during the flood period. He also announces a Jr. Op. 8BYV, has passed into the great beyond, and his key is silent forever. We will miss his sigs on the air. 8DIH wants more stations on 80 in the early AMs for schedule work. A good idea. 8DSY has been QRW with finals, and has spent most of his time on 20 with fine results. 8AKO is still working mostly from the "crib" on the lake, and the call is 8HB. 8ALU reports no news. 8BEV is installing a UX852. 8CMB got his First Commercial License, and is only 16 years old. Fb, Om. 8AYO has given up Xtal control, temporarily using TPTG. 8AEU remodelled and made a panel job out of it. 8CFL bewails his low total altho very active. Better luck next time. 8DPF a 201-A can only work 8BEV, but handled 11 messages just the same. We hope he gets connection to the power mains soon. FB, Om and keep up the good work. 8CNL is off the air with a defunct tube. 8CVE is on the air some. 8BZT is busy with married life. 8AXS also QRW. 8DIA has been having trouble with his S tubes, but has new ones now. 8ARW says 8BOW wasn't notified for license examination, and to notify the R. I. because they can't use 2nd grade licenses in Greenville. Hi! 8AYJ will be off the air all summer. 8DDQ's battery charger was stolen. The SCM said something about 8ALW and the YLs last time. 8ALW says he nearly got in bad with his O.W. Hi! and sorry error, Om. 8AWX reports 8DRX leaving Ohio and going to California. Sorry to lose you, Om. 8RN is aboard W.P.U. Str. Yosemite, having a lot of fun with the spark set. 8GL now has a chemical rectifier, instead of the old AC note. 8PL has been rebuilding. 8CCG moved QRA to Warren, Ohio. 8DQZ will be in Pittsburgh all summer. 8AVB has been on 20 mostly. 8AHH tried to drop radio, but once a ham, always a ham, and he is back again. 8ADH is very irregular and says he should have more time as soon as school is out, but as he has had the same YL since January, he won't make any promises. Hi! 8CBI is another ham about to enter the 5th stage, if his activity in radio is any sign. He *does* get on once in a while. 8BOP is using two fivers for Kenotrons. 8CLR says his pole came down twice. Busy with work and YLs too. 8DHS was at the Detroit convention, got a temporary license, so expects to be all right soon again.

Any of 20 meters is mighty FB compared to 40 and 80, altho the SCM wishes to impress the idea to 40 and 80, altho the SCM wishes to impress the idea of more early morning (just before and after dawn) work on these bands. The QRN is least then of any time of the 24 hours. Let's not give up the ship gang. Keep going. And, don't fail to come across with any suggestions you may have at any time. Good luck and 73.

Traffic: 8BAU 407, 8CXL 131, 8BNW 100, 8GZ 84, 8CPQ 47, 8DIH 44, 8DSY 42, 8AKO 39, 8ALU 36, 8BEV 33, 8CMB 32, 8ARS 26, 8BAD 24, 8AYO 15, 8AEU 14, 8CFL 11, 8DPF 11, 8CBI 10, 8AXS 10, 8DIA 8, 8ARW 8, 8AYJ 6, 8DDQ 5, 8ALW 5, 8AWX 4, 8BKQ 3, 8RN 3, 8GL 3, 8PL 3, 8CCG 2, 8KC 2, 8DQZ 1, 8AVB 1.

MICHIGAN—SCM, C. E. Darr, 8ZZ—8AUB is working hard to get the fellows organized there. 9CYU is putting in a 250 watter on 20, 40 and 80 meters. 9ANT is on 20 meters for keeps. 9CSI reports traffic in upper Michigan very light. 8DED says now that the DX contest is over, he can settle down to traffic. Don't forget to make schedules with him. 8DED is RM for western Mich. 8ZF and 8KN of Lansing are closed for the school vacation. 8CAU and 8DOJ are active again, probably for the summer vacation tourists. 9CE has a schedule in 8CPM and 9EGG and 9AYR daily. 8PF is trying to get an H tube to work on 20 crystal controlled. 8ZZ on 20 meters part of time, has worked many European stations. He cleared a message from Capt. Lindbergh's mother to Capt. Lindbergh in France thru nu1SZ. 9EAY has a new set with TP-TG on 20, 40 and 80.

Traffic: 9CM 10, 9CSI 11, 9CE 13, 8ZF 8, 8DED 42, 8MM 3, 8PF 5, 8DAG 6, 8ZH 3, 8ZZ 13, 8AUB 41, 9EAY 16.

ILLINOIS—SCM, W. E. Schweitzer, 9AAW—The Chicago Radio Traffic Assn. trophy is not won yet and this time, 9APY has won a leg. However, he must win it the next two times in a row or he'll not keep it permanently. The terrific wind storm of May 9 carried away many a good mast—and many not so good, mostly the latter. As summer is now with us, let's all try to send in some constructive information on conditions noted at your station. Pay particular attention as to what you hear and when you hear it. Let's keep the traffic ball rolling and set a record for summer work. 9AAE is trying out 5 meters. 9AAW attended the Michigan Radio Convention in Detroit. 9AEG is a new Chicago ham and promises to become a reliable station. 9ALZ likes 40 meters better than 20. 9AMO wants schedules with Iowa or Missouri. 9APY won the traffic cup this month. 9AWX, a new ham in Joliet, sent in his first report. 9AXZ is using one of the new 75 watters. 9AYB is going after the traffic trophy when school is out. 9BHM finishes school this month. 9BPX is going to put in a 50 watter. 9BVP wants schedules for checker playing. 9BWL was on a two weeks trip to Asheville, N. C. 9CIA lost his antenna in the recent storm. 9CNB is going to use an H tube. 9CPQ has gone to Linden, tests working Australia, N. Z., Madera, Portugal, Ind., for the summer. 9CSB was on during the DX Hawaii. FB. 9CWC is keeping schedules with 9SK, 9EAI and 9DMG. 9CZL has trouble controlling his set on 20 meters. 9DAF is going to increase power to a UX210. 9DBI has put in a new UX852. 9DDE is finishing exams for the summer. He worked nr-2FG. 9DGA complains of poor weather conditions. 9DKK is another station reporting. 9DXG worked nj-2PZ. 9DYD also lost his tower in the storm. 9EAI wants to be appointed an ORS. 9EGG is building a station for Senn High School. 9ELR is another whose aerial is on the "fritz." 9BL reports 9AM to be a real old ham returning to the game from 1908. 9IZ reports having calibrated his receiver. 9KA blew his H tube. He reports 9BA working FB on a 202. The Sr. op of 9MR will be home soon. 9NE uses 20 meters for DX and 40 meters for traffic. 9UX received as a present a 1500 volt motor-generator. 9VO worked four oa's and one OZ this morning. He also worked se-3AG, sr-2AR, ef8GI, gi6MU. 9AGG and 9UB built a stage of RF on 9AGG's SW receiver. 9AGG has the honorary titles Owner, Operator, Builder, Designer and Janitor of the radio station.

Traffic: 9APY 62, 9CPQ 60, 9DDE 58, 9CZL 53, 9CIA 51, 9AFB 29, 9VO 28, 9BTX 27, 9AMO 28, 9AWR 28, 9UX 23, 9EAI 16, 9IZ 13, 9BPX 14, 9CSB 14, 9BL 12, 9AXZ 12, 9DKK 9, 9ALK 10, 9NE 10, 9BWL 9, 9QD 7, 9DGA 7, 9BHM 6, 9DAF 6, 9KA 5, 9AEG 6, 9BVP 4, 9BNA 3, 9AHJ 3, 9AWX 2, 9AFF 1, 9DYD 1, 9CWC 1.

KENTUCKY—SCM, D. A. Downard, 9ARU—QRN during May was R9 plus. The SCM could draw an inch spark off his antenna and counterpoise almost any time during the day or night. 9MN has again

changed locations but still hangs on to 40 meters. 9ABR is getting his 250 ready to perk with DC on the plate. 9CMW will be back from school and on the air again soon. 9BAZ blamed it on QRN but when he replaced his old "B's" he sed the QRN was nil. Hi! 9BWJ has a new 50 foot latticed mast and is experimenting with voltage feed antennas. 9EI and 9BPB have arc sets going. 9BIQ has a 210 perking on 40 meters. 9CRD is on 40 with a 210 and worked Costa Rica right off the bat. FB! 9CJW, a Missouri boy attending Centre College, is leaving for home but says he will keep a sked with the fellows "back home." 9BPB worked six countries in four nights during the recent tests. 9ATV, 9ARU, 9OX and 9WR are out temporarily.

Traffic: 9BAZ 41; 9ABR 28; 9BWJ 10.

WISCONSIN, SCM, C. N. Crapo, 9VD—9DTK reports traffic the past few weeks slowing up, probably due to the heavy QRN, 9EK-XH reports 4DM is closed for the summer but has sked with 4LK on Mon., Wed., and Friday nights at 8.30 P. M. 9DLD is not pounding the key quite so hard now due to cut in range. 9EEF keeps schedules with 9CZH daily. 9BPW has been trying 20 meters. 9EHM dropped down to 20 meters and was QSO 6TX, 7NY and others at noon. 9SO has been keeping schedules with 8AMC and NR-2FG weekly. 9AZN's antenna is higher now with better results. 9BIB has been away at school for a few weeks at Ft. Wayne, Ind. 9CAV has installed a mercury arc and it is surely FB. 9ABM keeps schedules with 9EMD, Monday, Thursday, Saturday at 5.30 P. M. 9DZV and 6BLX operated at 9BWO some last month. 9CDT put up a Hertz antenna and is getting out much better. 9EAN reports not much doing this month. 9COI schedules were discontinued while operating 9EGH in International Relay Tests. Schedules will be continued with 9BOC, 9CGY and 9EMD. 9BWZ is having trouble getting his generator to work properly but keeps traffic moving in his direction.

Traffic: 9DTK 72; 9EK-XH 64; 9DLD 38; 9EEF 37; 9BPW 22; 9EHM 20; 9SO 68; 9AZN 15; 9BIB 11; 9CAV 11; 9ABM 10; 9BWO 8; 9CDT 8; 9EAN 3; 9COI 2; 9BWZ 2.

DAKOTA DIVISION

NORTHERN MINNESOTA—SCM, C. L. Barker, 9EGU—Is the old "warm weather damper" going to stop us any this summer, gang? I say NOT. How about it? 9DKR and 9AOG are leaving for Calif. the first part of June to look for work and see the country. 9BMR has got going again, after a lapse of a few weeks. 9BMX says "20 meters is getting better" and he works the globe. 9EHO is doing fine work on low power on 20 meters. 9GZ is moving to Tenney and keeps his 250 going. 9BVH is building a crystal controlled 5 meter transmitter to use in the 5 meter CQ party. 9ABV fell off a bit this month. 9EGF had to originate all his traffic this month. Hi. 9BTW is a new station at Howard Lake, stepping right out with low power. 9CIY is a new station at Hibbing that is very promising and started right out with a good supply of schedules. 9CTW is putting in a new UX852 with DC and voltage feed Herts. 9AOK is going on the road with a portable set of 20 and 40 meters and wants the gang to listen for him. He handled a RUSH message from Chile. 9CKI is going "crazy" on 20 meters and finds plenty of traffic down there. 9EGU finds the Reinartz transmitting circuit very FB in every way. Business QRM was the reason for a 3 day rebuilding job lasting 3 weeks. Hi. 9KV has been QRW international tests and also trying to get the R.I. to come to Duluth to give exams. 9EGN has a new 50 and is praying already. Hi. 9BJD finally got located in his new shack and is on regularly. 9CWA has a new UX852 and a new transmitter going good. 9AKM built a plate transformer that gives 800 volts but can't find time to use it. 9MF is about ready to start the "life grind" as he calls it.

Traffic: 9EGN 56, 9KV 49, 9CKI 29, 9AOK 25, 9CTW 23, 9CIY 16, 9BTW 15, 9EGF 8, 9ABV 8, 9BVH 7, 9EGU 7, 9BJD 5, 9CWA 5, 9DKR 5, 9BMR 5, 9BMX 4, 9EHO 4, 9GZ 4.

SOUTHERN MINNESOTA—SCM, D. F. Cottam, 9BYA—Traffic was better than expected this month. A number of stations are keeping on with the good work. There are neither new appointments nor cancellations this month. Due to the warm weather and beautiful Minnesota, it is pretty hard to stay at the junk as much as when the snow is flying in the winter. Minnesota is a great tourist state and the Minnesota gang welcome hams at their homes and stations. In case out of town amateurs are in Minneapolis, please give us a ring and we will try to make your visit to the city a little more pleasant. School is putting the damper on high totals, also track, baseball, etc. QRN will be bad this summer, no doubt, so why not do some engineering and experimenting all your own. You may find some very interesting results. These are just suggestions you know but what do you think of them?

9CPM is the most active station again this month. 9DBW is on 20 and does good short distance work at night with it. He holds one sked and was QSO Australia. 9DWO is rebuilding his station and 9WL for 20 meter work. 9BN holds two skeds with 4 ops. 9DH is a new op at 9BN. 9EFK holds a number of skeds and works his DX from 4:30 AM on. 9CAJ is on the road and is only home on Sat. and Sun. 9XI is not very active and is only on occasionally. 9IG is going once more. 9AKT uses a complete remote control xmitter. 9COS is looking for more apparatus to complete an elaborate transmitter. 9BHZ is QRW and is oping whenever he can. 9GI got married. Congrats, OM, from the gang. 9BYA has had the delightful job of housecleaning. 9DBC has been busy with track and won every dash event in the state meet. 9EFO is very QRW with school and as soon as school is out, will rebuild everything and arrange skeds. 9CIX put up a new stick and looks for better results. 9DEQ is on 20 and likes it. 9CCX works OZ, OA and altho QRW at WCCO, manages to pound anyway. 9DWO is rebuilding for 20 meters. 9DGE is a cook on the "Layrence J. Palmer" on the Lakes. He gets his eats free. Hi.

Traffic: 9CPM 380, 9DBW 68, 9BN 44, 9EFK 34, 9CAJ 32, 9XI 24, 9IG 22, 9AKT 18, 9COS 18, 9BHZ 16, 9BYA 16, 9DBC 12, 9EFO 12, 9CIX 11, 9DEQ 8, 9CCX 4.

NORTH DAKOTA—SCM, G. R. Moir, 9EFN—9BRR leads the Section this month by some fine relay work and finds a UX210 with tuned-plate tuned-grid on 20 meters FB for work with oh6BDL. 9DYA wants a sked with a nearby 80 meter station. 9BJV worked nq2RO with his two UX210's. 9DM lost his pole in a wind-storm but worked all districts on "40".

Traffic: 9BRR 26, 9BJV 5, 9DM 10.

SOUTH DAKOTA—SCM, F. J. Beck, 9BDW—Nearly half of the active stations in the section operate on 20 meters. Examinations and graduating QRM together with QRN on 40 and 80 cut traffic badly. RM, 9DWN, reports new S. D. University skeds so he's on 20 now with a new 210. 9BKB handles several skeds. 9DB worked several foreigners on 20 meters during tests. 9DLY, a new ORS, keeps early morning skeds on 80 meters. 9CZG has good delivery of his messages. 9AJP is trying 20 meters and likes it very much. 9BBF, the O-O, is rebuilding after keeping skeds with some oa's for over a month. 9AGL is going to sea again this summer but will be back on in the fall. 9BGL suggests starting a "new ham month". 9DBZ reports school QRM. 9DIY has little time to operate. The Sioux Falls Club held a picnic this month. 9CJS is building a Scotch receiver, a la 9DXY. 9NM had trouble with the charging outfit but did some DX on 20. 9BOT has farm QRM. 9DYX is a new station at Rapid City and 9BXY at Bryant. 9TI gets RAC reports on 20 from a B battery xmitter. Some audio fading. Hi!

Traffic: 9DWN 70, 9BOW 48, 9BKB 46, 9DB 20, 9DLY 19, 9CZG 12, 9AJP 10, 9BBF 8, 9AGL 8.

DELTA DIVISION

LOUISIANA—SCM, C. A. Freitag, 4UK. The only station now handling any flood work is 5PM, New Orleans, who has schedules with 5TC and 5AIQ, both in the badly flooded districts. 5UK's emergency transmitter has been installed on the roof of the A. T. & T. Building, making numerous tests on schedule with 4RH, Atlanta, Ga. In case of emergency the station will be operated under the call letters 5UK. In the meantime, the regular station of 5UK is being operated with a 7½-watt transmitter, and is getting out fairly well. 5ASE is a new 7½-watt station at New Orleans. 5IE is on both 20 and 40 meters with much success. 5QJ has been doing some nice DX on the 20 meter band, working several foreign countries. He says on 40 meters he is unable to work anything but oa's and oz's (not even nu's). Hi. 5AEN has been assisting in the flooded area, and will be on again full force when the excitement is over. 5UT is doing well with his 2—7½-watt tubes and planning to install a 50 watter.

Traffic: 5PM 31, 5EB 25, 5UK 9, 5IE 9, 5NS 7.

ARKANSAS—SCM, Wm. L. Clippard, Jr.—5AIP.

Arkansas amateurs had a fine month of msg handling, and from our report one can see that OM static is not going to retard the work here this summer. 5CK and 5ABI are two new ORs. Look 'em over fellows and see their totals. 5CK has the highest total made in the state for some time. How about the BPL next month, OM? 5ABI handled a bunch of flood Red Cross traffic. 5AW has a new 75 watter. 5CJ will be on soon with a new set. 5SI is still going FB as usual. 5JK reports 40 meters better than 80 for msg. handling. He has been trying 20. 5JB and 5FF are going away for the summer, but we all hope to see them again next fall. 5AKF has his Delco now and will be on soon. 5SI says 5ER has a wireless Hertz ant. It has no lead-in (that one can see). Hi. Hi. 5AIP has been having trouble with a msg. Come on fellows, let's put Arkansas on top in amateur radio.

Traffic: 5CK 82, 5SI 35, 5ABI 35, 5AW 28, 5JK 18, 5AIP 6, 5JB 4.

MISSISSIPPI, SCM, J. W. Gullett, 5 AKP—9QZ, 5PJ, 5ARB and 5ANP failed to report. Ferrell at Greenwood sprained his ankle and this will keep him off the air as he can't erect his antenna and counterpoise until he is able to get around again. 5QQ has come down to 40 meters and worked lots of stations. 5AUB is rebuilding again, despite YLs. He threatens to have a real transmitter. 5API says no news and no DX. 5AGS was QRW exams, due to going to camp. 5QZ is trying to sell out. 5AQU is working with two little 7½ watters on 20 meters and reports it FB. His 20 meter DX so far is ef8YOR, nr1UR and oa4BD. He is having some trouble with his present receiver. 5AKP is doing manual labor trying to get his heap to perk on 20 meters which it refuses to do although rebuilt several times. Gang, please cooperate with the RM and SCM by sending reports regularly.

Traffic: 5AKP 33; 5API 28; 5QQ 11; 5AQU 2; 5FQ 14.

HUDSON DIVISION

NORTHERN NEW JERSEY—A. G. Wester, Jr., SCM, 2WR. Traffic has fallen off, however the percentage of ORS reporting in the past month was FB and the SCM thanks you for your fine reports. 2KS has requested that his ORS be cancelled due to leaving amateur for some time. 2CJX, an old time spark station, is now in operation and desires an ORS. 2ABE has filed application for ORS. 2CO in communication with NIDK of the ice-2AWQ 5, 2ALS 6. Richmond: 2AYH 2, 2ABO 13, patrol. 2AT has been making a business trip which kept that station silent during the tests. 2CP's better half is confined to the hospital and we all wish her a speedy recovery. 2CW is keeping amateur radio in Caldwell on the move. 2DX when next heard will have a mercury arc running his new 20-40-80 meter crystal controlled transmitter. 2EY has hard time getting on the air. 2JC not on, due to transmitter being dismantled. 2FC is on nightly six to seven P.M. Eastern Stapdard Time. 2KA finds it hard to keep schedules. 2ALM is going along fine on 20 meters. 2ANB is very QRW school work. 2BQQ is finding it hard to find time to operate. 2CGK is still QRW BCL work. 2CQZ is the proud possessor of a new flivver. 2CTQ has been QSO 15 countries on 20 meters. 2CYV hopes to handle the summer traffic for the Mich. Greenland Expedition NX-1XL of which 2AZA is operator. 2GV has a new QRA which is 8 Sunnyside Terrace, E. Orange. 2CDR reports that sb7AB is a YL. 2BIR is experimenting with Hertz Antennas. 2IS is putting all effort experimenting with low power transmitters. 2AVK shut down to neighbors kicking about key clicks. 2QI had the misfortune of blowing the complete rectifier including kenotrons and transformer. 2ADL had installed the TGP Circuit. 2BAL was QRW helping getting the Hudson Division Convention working. 2AOP has filed application for an ORS. 2CJD has a new antenna as he claims the old Hertz did not Hertz.

Traffic: 2WR 1, 2AT 2, 2CP 7, 2CW 3, 2FC 1, 2KA 4, 2ALM 32, 2CPD 6, 2CQZ 4, 2CTQ 46, 2GV 1, 2CDR 11, 2BIR 6, 2IS 8, 2AVK 6, 2ADL 34, 2BAL 6, 2CO 26, 2AOP 37, 2CJX 10, 2CJD 23, 2ASZ 13.

New York City & Long Island:—F. H. Mardon, SCM, 2CWR—There is a noticeable drop in reports this month, several being among the missing. Watch your step. Three non-reports and your ORS is automatically cancelled. Don't get Spring Fever—the Spring hasn't started here yet. And besides, the Spring and Summer are the *best* time for DX on the higher frequencies. Several requests have been coming to the SCM for appointment as ORS. I have not answered all due to pressure of business elsewhere so let me again state thru these columns that it is necessary for a station desiring to become an ORS to send three consecutive reports after filling his application with the SCM before his application can be considered. The application is then forwarded to the Route Manager of his Borough for investigation and if Oked the appointment is put thru.

Manhattan:—2EV is busy overhauling his station and getting it ready for the summer rush. 2ANX also rebuilding, now is remote controlled, break-in system reports, FB. 2BCB is building a new receiver and as he works at night again he is after some afternoon scheds. 2AMJ is now using crystal but can't report on it yet until he gives it a better trial, says it seems FB.

Bronx:—2BNL says nit at his station but that 2IH has moved to the top of Ft. George Hill and 2HH is installing 2-250 watters on 80 meters. 2ALL has his mercury arc going full blast now. He recently handled a msg. New Zealand and Summit, N. J., that was originated and delivered within 24 hours. FB. 2ALP wasn't on much this month but has a good tfc total due to some reliable scheds. He reports 2ARD and 2AWU are rebuilding for 50 watters. 2ALW reports nit tfc on 20. 2BBX reports working oa5BW for one hour and 25 mins. with same old lowpower set. Daylight all thru. QSO R5 at Australian end. How's that? That fellow BBX sure knows his red and white onions. Congratulations, OM, 37.7 was the wave. 2CIYX is rebuilding for T.P.T.G. circuit. Ready soon.

Brooklyn:—2AWX now uses T.P.T.G. in place of the old Hartly handling HQ traffic with effect. 2AMI is doing his stuff in great style now that he is an ORS. 2AVR is keeping some good scheds and going along great. 2ADZ has been ill but is better now and is getting some new scheds and everything is FB. 2ABP made a good start in his first report. What's the use of saying anything about 2PF, he is always busy and at the present time more so on account of the convention. 2BRB took the 1st Commercial Examination. Not on the air much just now. 2APB-CCD was out of town but managed to get in a report. He reports things OK. 2APD was also out of town but was busy with tests he has 70 points in tests, and so far is sixth.

Long Island:—2ALS is now in Astoria and says DX will be fine there. He is going to use X'tal. 2AWQ reports all OK. 2AGU has been QSO lots of foreigners lately and all report R4 to R6. 2BSL says very little tfc on 20 but lots of DX. 2AJE almost forgot to report but got it in time. 2AVB hopes to lead B.P.L. next month.

Richmond:—2ABH was only on two weeks but managed to handle traffic when he was on. Richmond is certainly getting life and I want to congratulate the RM and all who are behind him out there. Keep it up. 2AKK nil to report. Just working that's all. 2AKR reports things about the same. 2ABO the Sec'y of the Staten Island Radio Club had the misfortune to blow his receiver tubes. He has new and larger ones now. The Staten Island RC is now on the air under the call of 2CPG, and going strong. Reports the best season ever and getting better. 2AYH reports tfc bad "Only two" better two real ones, OM than rubber stamp ones. Keep up the good work.

Traffic: Manhattan: 2EV 12, 2ANX 25, 2AMJ 48, 2BCB 16. Bronx: 2BBX 49, 2ALP 123, 2ALL 21, 2BNL 8. Brooklyn: 2APD 212, 2APB 14, 2PF 14, 2ABP 28, 2ADZ 20, 2AVR 40, 2AMI 18, 2AWX 7, Long Island: 2AJE 4, 2AVB 48, 2BSL 1, 2AGU 26, 2AWQ 3, 2ALS 6. Richmond: 2AYH 2, 2ABO 13, 2AKR 7, 2AKK 4, 2ABH 10.

EASTERN NEW YORK—SCM. Earle Peacox 2ADH—Rosenthal, 2QU, takes the honors as most consistent traffic station in this Section. FB. OM! Several msgs for Europe were handled. 2PV kept skeds with 5CK and 3BCD and had some good QSO's within the Section on 40. 2CNS will be off for a few months if he rents his place for summer. 2ANV handled a few despite a bad power leak. The SCM has found it necessary to resign due to his new work and urges cooperation with the new leader as soon as you have chosen him by nomination and election.

Traffic: 2 QU 54, 2PV 15, 2 ANV 4, 2CNS 4.

MIDWEST DIVISION

NEBRASKA—SCM, C. B. Diehl, 9BYG—9AL is rebuilding. 9CJT is tinkering with 20 meters. 9CNN is busy with his work. 9EEW is rushed to death with his railroad at this season. 9AWS and 9BYG are rebuilding. 9ASD is putting a fifty. 9DI and 9DAC are graduating. 9BOQ is busy on the farm. 9DUH is in his busiest season. 9BBS is back on the railroad again and this is his last good report for a while. 9BQR is still fighting 40 and 20 meters.

The Route Mgr. reports business very light throughout the Section and very little traffic noted outside this Section.

Fetterman is having a busy time at his work and expects it will be late June or July before he can do much radio work. Craft and Williams are having their busy season. 9QY is right in the center of planting his corn so the report is light. 9CJT is having a lot of fun with 20 meters but "sings" because not more traffic there. Badgerow is rebuilding his outfit from the outside in and says that if it doesn't work better than before he might say something. 9BYG will be on the air this month after a year's silence. Bamer is so busy graduating that he hasn't time to go near his "pet". Magnuson is also very QRW and plans now to increase his power by fall. Miller says that he hopes he never has to graduate again as it takes too much time away from his hobby. Hi. Jones is very busy too but found time to work in the foreign tests a bit. Larimore has to QRT himself for a while on account of going back on the road. Chesley still has the usual hard time trying to get down. Sisler, formerly of Omaha, has been issued a portable license under the call 5ADV and will tour the middle states this summer in his Essex, looking for data on portables, etc.

Traffic: 9CNN 6, 9QY 13, 9EEW 3, 9CJT 1, 9ASD 12, 9DI 9, 9DAC 3, 9DUH 10, 9BBS 51.

KANSAS—Fergus McKeever, SCM, 9DNG—9JU turns in a very interesting and complete report. He is getting under way as an official observer and is also keeping up his traffic in fine shape. 9BUY is busy arranging for the Brass Pounders Club meeting this month, but handled some messages to England and Australia. 9COR worked EN and NR despite of school QRM. 9BII is co-operating with BCL's and hopes to convert a few. 9DNG is trying the same thing. His new 250 watter is working fine and R9 in Australia. 9BYQ, 9OFN, and 9CKV all are moving good traffic. 9CFN is also doing a little DX on the side. "The big three", 9AEK, 9CET and 9CV, are still bringing home the bacon at Topeka. All three took part in the international tests with good results. ex-9DSR is now in Ohio. We were sorry to lose him. O——— our loss will be the 8th district's gain. 9BGX leads the state in traffic. He also took part in the relay party. For consistency, 9CNT is THERE, being on several hours daily and doing splendid traffic work. 9CVL returns from college and will be at the old key this summer. 9DPW put in a Hertz and thinks it's FB. 9HL is setting the pace in schedules. He has half a dozen good ones and is coming along. 9LN and 9CLR of Lawrence are on regularly both going in more for DX than traffic. The latter is to be a ship operator this summer.

Traffic: 9DNG 16, 9BII 4, 9CKV 15, 9BYQ 28, 9AEK 18, 9BUY 10, 9HL 27, 9COR 4, 9CVL 2, 9CNT 25, 9CET 30, 9CFN 52, 9DPW 32, 9BGX 88, 9CV 7, 9JU 19, 9LN 25.

IOWA—A. W. Kruse, SCM, 9BKV—Traffic is still dropping and as usual QRN is to blame for the low totals. The RM is working hard to keep the state line up with good reliable routes, and those of you who are going to be active this summer please cooperate with the RM. 9BWN is handling traffic hot and heavy and is keeping schedules on 20, 40 and 80. 9CZC lost his mast with a resultant drop in his usual high total. 9DVG is busy building a new 500 watt transmitter at KWCR. 9DAU is hearing a lot of DX on hts new Grebe. 9EFS is keeping his 50 hot with 1600 volts RAC from a mercury arc rectifier. 9CGY is using a fiver and a 201-A and says he don't know which one is working. HI! 9CS is using a 2 feeder wire Hertz on 40 meters. 9EHN continues to pound away on all bands. 9DEA is trying 20 and 40 but hasn't had any results yet. 9CZC, the RM, wants to hear from you fellows who are going to be active this summer and if you are interested in working reliable schedules drop him a line.

Traffic: 9BWN 124, 9CZC 22, 9DVG 19, 9DAU 14, 9EFS 13, 9CGY 12, 9CS 11, 9EHN 8, 9DEA 8.

MISSOURI—SCM, L. B. Laizure, 9RR—St. Louis ham activity well sustained during QRN season by two stations, 9ZK and 9DOE hitting the BPL with several others handling good totals.—9BEQ, 9BHI and 9DUD. 9ZK has four transmitters going. 9DOE is spending the summer on Great Lakes and expects to pound brass either on a commercial vessel or on a lighthouse tender. 9BHI reports skeds fell down due to QRN and he is working mostly daylight stuff. 9DUD has worked mostly foreign DX this month. 9BGO handled a good total and kept several early morning skeds with 9CZZ, 9CTS, 9NW and 5ES. 9DMT was put out on 80 meters by QRN and is changing to 40. 9HY lost his antenna in hail and windstorm and he moved and rebuilt twice. 9BZM is doing some experimenting. 9DTQ closed up for QRN. 9DIX is still visiting Chicago hams. 9CYC lacked only 99 messages short of the BPL. 9AJW is having good luck with the new bottle. 9DKG was unable to handle tfc due to school but promises some action in June. 9DAE dropped all skeds due to QRN. Traffic in Kansas City was nil this month. 9ZD is on the most so far as reported. 9RR closed down indefinitely due to financial QRM and will not be on again before winter if at all. 9ACA is still off the air following a move. 9DQN is doing some experimenting but DX not very great. 9ADR and 9ACA have held some reorganization meetings for the amateur club but not much enthusiasm at present due to short funds on all sides. The R. I. has been over this territory lately and a number took the exams at Kansas City and Joplin. 9BMS and 9HY passed in Joplin and a number passed the commercial test in Kansas City.

Traffic: 9ZK 105, 9DOE 106, 9BEQ 45, 9BHI 49, 9DUD 12, 9DAE 3, 9AJW 28, 9CYC 1, 9HY 10, 9BGO 35.

NEW ENGLAND DIVISION

RHODE ISLAND—SCM, D. B. Fancher, 1BVB—With the help of Army traffic, 1BQD hit the BPL. Both he and 1AAP have been appointed Army stations and took active part in the recent war game between the Army and Navy. Next month is going to see a bunch of cancellations if necessary to get rid of dead-wood, and prove ourselves "small but active".

1BIL is sailing on the KTB but will be back in July. 1CKB has been off this month putting the Xmitter back of a panel. 1AID is going full blast on 20. nu8JQ who just returned from the Orient called on her recently. 1MO is still trying to get parts for his filter. Should be a pip if he ever gets it going.

Westerly: 1AAP has 1CD's MOPA Xmitter going on 80 with a tone like an Xtal set and is renching out well. He handled a great deal of traffic during the war game. 1BVB moved quite a bit of traffic due to schedules.

Newport: 1BQD is the star man this month and doing excellent DX as well. FB!

Pawtucket: 1AMU kept schedules, rolled up a good traffic total, made some DX records using 20 meters and is now putting in a mercury arc rectifier. He certainly keeps Pawtucket on the map in fine shape.

Traffic: 1BQD 124, 1AMU 74, 1BVB 63, 1BIL 24, 1AID 20.

EASTERN MASSACHUSETTS—SCM, R. S. Briggs, 1BVL—The message totals for this month were quite low due to the usual summer slump. A lot of us have been bothered by school QRM and others have shifted their activities to working DX on 20 meters. It is easy to handle traffic with the West Coast and Europe on 20 meters. 1FL is a new ORS in Hudson and sure puts some snappy signals on the air. 1SL, who is an officer in the Army Radio Net, was at Fort Adams operating 1WF during the recent Army-Navy maneuvers. 1AWB also operated there. 1CRA handled messages for Lindbergh and also some for the recent flood. 1ACH has been QRW hunting for a power leak. 1BKV, 1RF, 1ADM and 1ABA have been active on 20 meters, handling International Relay messages. 1BYV says he has now worked 20 countries and five continents. Mr. Kolster, the R.I. and Mr. McCarthy, who is also well known to us hams, paid 1BYO a visit to investigate some BCL trouble, but everything turned out OK. 1ON was busy on 38 meters with the relay contest using a 203A. He also has become a "wacker". FB. OM! 1BVL has been off the air due to school QRM, but watch his smoke this summer. Hi. 1ALP gets on the air occasionally, but we are sorry to say that he is

now an EX-ORS. 1AVR claims that he has a 201-A that works better than a 202, 210, or an H tube. 1OG and 1GP have been moving so have not had the chance to do their stuff. 1APK was on 83.5 meters handling Army Amateur traffic. 1PB is beginning to reach out on 80 meters. 1KR handled quite a few. The Eastern Massachusetts Radio Association held their second annual banquet on May 20th. From various reports it appears that the gang enjoyed themselves as usual. 1XM has the honor to be represented in the coming MacMillan expedition by one of the star operators, Mr. C. E. Himoe, ex9AOG-9ZE, who is to be operator on the Bowdoin. We can hardly wait to hear him sign WNP. 1AAY, also from Tech., is to be operator on the supply ship, "Radio". 1AXA arranged his Xtal set so as to use both 40 and 20 meters. 1NQ is going to change his QRA. 1BDV and 1CJR have been inactive due to school QRM. 1AHV is still on with crystal-control and expects to be on at his summer station 1QZ. We are very sorry to lose one of our ORS, 1OU, who is moving his outfit to Providence. 1AYX is off the air until fall.

1LM handled a few messages. 1ACA is on 80 meters during the afternoon and finds 20 meters a relief from QRN during the evening. 1NV has just got started again on 20 meters. 1UE has been fooling some with fone on 80 meters.

Traffic: 1CRA 66, 1FL 60, 1AGA 51, 1ACH 48, 1KY 46, 1BYV 36, 1LM 30, 1GP 22, 1PB 17, 1AHV 14, 1AVY 10, 1YC 8, 1ADM 8, 1APK 6, 1AWB 6, 1ON 4, 1NQ 4, 1RF 2, 1AXA 2, 1BKV 1.

VERMONT—SCM, C. T. Kerr, 1AJG—Sure glad to see how you fellows keep sending in those reports. Thanks, and let's step on it and double that traffic total. Notice we rolled most a hundred for three stations which is going some for Vermont in the good old summer time. 1AJG sighting up 20 meters but h'ain't got there as yet. 1IT is high man and is vy QRW bizness. 1BBJ is also QRW office. Sorri, OM. 1BD sez he isn't dead but QRW wid Pontiac and YL. 1BEB on 20 and 80 meters now and just one msg under 1IT. He is sure sailing on 20. 1BJP shut down moving but on soon again.

Traffic: 1BEB 42, 1IT 43, 1BBJ 18.

CONNECTICUT—SCM, H. E. Nichols, 1BM—The summer season is fast approaching and the static is increasing but there still remain the old faithfuls who never give up. It is as much of a thrill to copy a message through intense QRN as it it is work DX when everything is favorable. This indicates an increase in quality operating instead of quantity and any amateur who makes a practice of doing it deserves real praise. 1AOX, our Army Amateur station, leads the traffic list this month and makes the BPL as well. 1AOS will be with us soon as he intends to install his set at his shore cottage this summer. 1BHM has appointed 1CTI and 1AOX as his assistants in their counties and is looking for other good ops to line up the other sections of the state. 1MK is working on both 40 and 80 now. The 80-meter band is getting to be the sister wave to the old 200-meter one and there is more real A.R.R.L. sociability on it than ever before. Does anyone else feel this way or is it imaginary on your SCM's part?

1BDI, our CM, handled traffic with nnM3Y-1NIC (U. S. Marines at Nicaragua). Sure fb. OM. 1BEZ reports having arranged a schedule with an op at Honduras bue due to little rouble with rectifier has been handicapped temporarily. 1ZL has swung from the Hartly to the tuned plate and grid circut, and reports better records than ever. 1VB, 1BJK, 1AOX have been doing very noticeable traffic work in their vicinities and your SCM has originated quite a little traffic to test the outlet in this direction and feels it is quite satisfactory. The SCM hopes to increase his power so that all ORS in his section will be able to copy him. 1OS, our Danbury YL station, reports handling a message on its way to India, which didn't seem to her a bit from the ordinary.

Traffic: 1BGC 6, 1BQH 7, 1CTI 10, 1BYM 11, 1BLF 12, 1TD 13, 1ZL 16, 1BEZ 20, 1BHM 21, 1ATG 24, 1MK 67, 1BJK 45, 1AOX 124, 1BDI 20, 1OS 16, 1ASD 29, 1BCG 40, 1VB 41.

NEW HAMPSHIRE—V. W. Hodge, SCM, 1-ATJ—The "Summer-slump" has apparently hit this Section as only 6 stations reported. Please send your Form 1 cards to me even tho you have no traffic to report. 1IP and 1AOQ have been rebuilding. Our R-M. 1OC, is at Riverhill, N. H., for the summer, on a well earned vacation. 1JN says the Manchester gang are ready for traffic. 1ASR neglected to send any news with his report. The SCM will be off the 80 band until a new transmitter can be assembled. The new "OW" swiped the glass towel bars out of the old set. Hi!

Traffic: 1IP 69, 1JN 28, 1BFT 26, 1AOQ 16, 1ASR 8, 1ATJ 1.

WESTERN MASSACHUSETTS—SCM, A. H. Carr, 1DB—Good weather is having its telling effect again and our traffic has dropped some this month. Fifteen stations failed to report at all. We have made up for all this in a way by the inauguration of the amateur free message service. Much thanks is due to Dr. Tessmer, 1UM Pres of the local radio Assn. and Brownie our RM for this new scheme of getting messages and we are all putting our shoulders to the wheel and look forward to it going over big. It was certainly fine of the Mayors of Worcester and Hartford to cooperate with us the way they did. 1AAE has kept schedule with NIDK nearly every night at 6 pm. 1AAL did himself proud by operating his station with the message from the Mayor of Worcester to Mayor of Hartford. 1AJK had two weeks of active radio duty with the Naval Reserve. 1AJM is on 20 meters and handled some of the relay contest reports from Chile. 1AKZ is also on 20 and says he is having good luck QSO with South America. 1AMZ will be on the air regularly again in a month. 1APL makes the BPL again for the fourth consecutive time. 1ARE says he is away from home most of the time now so that is why it is so quiet in his direction. 1BIV's new QRA is 10 Emerson Rd., Worcester, Mass. 1BVR says he will be on the air the last part of June. 1XZ is shutting down for the summer. 1WQ is a new ORS and wants to know if any of the gang is going down to Fort Monmouth, N. J., for the CMTC, he wants company.

Traffic: 1AAE 35, 1AAL 55, 1AJM 37, 1AKZ 10, 1AMZ 1, 1APL 127, 1EO 9, 1DB 8, 1WQ 8, 1AGA 90.

MAINE—SCM, Fred Best, 1BIG—1BFZ leads the Maine Brass Pounders, and his work is certainly appreciated by the SCM. 1AIT says it has been impossible to relay east or south in Maine because of punk weather. 1FP is striving to get a good contact station located at Bar Harbor, Eastport and Houlton, but as yet has had rather poor luck. Come on fellows, let's hear from active hams in these places. 1AUR has a new UX-852 which is already perking on twenty meters. 1COM reports school QRM has bothered his traffic total. He has been able to get his transmitter working on 20, 40 and 80 meters. He reports that 1DCX is moving to Norway after school closes. 1ACV still keeps Houlton on the map. Perhaps 1CZ also of Houlton will be with us another month. 1BNL reported, but handled no traffic. 1BIG, 1KL and 1BMS spent a delightful (???) 15 days on the USS Mohave and USS Wandank, participating in the joint Army-Navy War Maneuvers down around Newport, R. I.

Traffic: 1BFZ 104, 1AIT 61, 1BIG 25, 1FP 23, 1AUR 22, 1COM 6, 1ACV 1.

NORTHWESTERN DIVISION

MONTANA—SCM, O. W. Viers, 7AAT-7QT—7PU has his station all packed and ready for shipment and he hopes to see the gang via "6???" soon. 7AFM, the new ORS at Nasauha, says things are held up on account of rainy weather. 7QV is still very busy but works the key when he can spare the time. 7EL is very busy on the ranch. 7AAQ is getting things shined up and will soon be on with 200 watts. 7AAT-QT is very busy with the new YL but hopes to have the station back on the air in a few weeks.

Traffic: 7PU 24, 7AAT 12, 7AFM 4.

WASHINGTON—SCM, Otto Johnson, 7FD—7UL at W. S. college takes traffic honors this month, crashing into the BPL. They handled messages from the WSC Engineers Show. 7EK takes DX honors working ei, em, es, nz, en, oo, and others. 7DF is now a WAC thru working foA3Z and ac8HB. 7UQ worked eg-5HF. 7ACB worked eb4WW. Both use 210's. 20 meters, of course. 7VL took a lot of traffic using a new 852. 7GP worked many countries in the tests. 7AG is going again in the new QRA. 7AIY is also. 7MZ, 7NH and many others are coming on for the summer. 7AAE and 7EH keep things moving in Tacoma. 7AM is trying 20. 7FD had his vacation during the tests and

didn't get time to get on the air. 7AES, 7AET and 7JS are newcomers. 7TJ is fishing for DX. 7QB and 7MP have taken to the woods for the summer. 7GO is coming back with an 852. 7AW has a new xtal control xmitter. 7TX is doing good work on 20.

Traffic: 7UL 129, 7VL 80, 7DF 55, 7UQ 52, 7ACB 39, 7AM 29, 7AAE 28, 7EH 13, 7EK 12, 7AG 9, 7AIY 4, 7FD 3, 7TX 8.

OREGON—SCM, A. C. Dixon, 7IT—R. W. Wright, 7PP, 310 Ross St., Portland, has been officially elected SCM of the Oregon Section and will take the place of Ashley Dixon, Jr., who was acting SCM until one should be formally elected. All reports and communications should be addressed to 7PP after this.

The ORS turned in a good total this time. 7SY has kissed ham radio goodbye for a time but went off with a good report. 7AEK showed up well with the sync. 7EO works Hawaii and KFZH. 7ABH has a weekly schedule with oh-6AJL and keeps it consistently. 7ACG in Lexington graduated from high school on the 20th so was QRW. 7AV is on just enough to be sure that his xmitter will oscillate. The weather in Oregon is very pleasant this time of year and no doubt the fellows are answering the call of the wild instead of DX calls.

Traffic: 7SY 33, 7AEK 42, 7AV 2, 7EO 16, 7JO 6, 7ABH 15, 7ACG 10.

IDAHO—SCM, H. H. Fletcher, 7ST—There are several ORS certificates that are going to be cancelled next month if you fellows don't snap out of it. Of course, it's up to you to make the state what it is going to be but I want you to know that the SCM is pulling for the betterment of radio. 7GW is the new RM and says he is going to do his best. 7YA is on nearly every day but isn't hitting par. 7QC comes next but he is QRW with business. 7ACN rebuilt his xmitter. 7ACK is just finishing up his year of school teaching. 7ABB has been QRW school but piled up six points in the I.R.P. 7GW operates every night but has been doing experimental work. 7EJ is on a trip east. He is taking notes on everything he sees.

Traffic: 7YA 24, 7QC 22, 7ACN 4, 7ACK 2, 7ABB 2, 7GW 1.

PACIFIC DIVISION

EAST BAY—SCM, P. W. Dann, 6ZX—Acting SCM, J. H. MacLafferty, 6RJ—Activities in this Section during the past month show an increase instead of the usual summer slump. Interest in 20-meter work and the fact that the East Bay hams are getting together more than they have in the past is the cause of the good reports received this month. 6AYC and 6IT operate as guide posts on the lower and upper ends of the 40-meter band, keeping 6th District stations in their own wavebands. 6APA, 6ANE and 6CTX, our Route Managers, are QRW lining up schedules and setting an example in moving traffic. 6AYC is back on the air due to postponement of the cruise of the yacht "Idalia". 6BER is a new ORS operating every evening on 80 meters and is QRV for traffic anywhere. Jack Ward (Kacy), owner, operator, janitor, etc., of 6CKC, is QRW publishing the "Ham-meter" but manages to find time to handle traffic. He leaves June 15th to tour the east in a Chevvy with 6CLS. 6RJ was appointed Assistant SCM and wants the support of every East Bay amateur in making this Section what it should be. 6CZR says he is ready for traffic all the time. 6IM is our star performer on 20 meters. 6CCT is QRW in the Television Department of the Telephone Company every night but Saturday. 6ANE has also been QRW with night work. 6AFT was R6 at sc3AG and says plenty of traffic on 20 meters. 6CTH says his new location in Berkeley is FB, judging by R8 reports from the East Coast and OH. 6ALX sent the ORC code class a course of study and advises use of 2-cent stamped envelope for delivery of messages by mail with return address. Messages with wrong address will then be returned to sender and proper address can be obtained from station of origin. 6APA has arranged schedules for several ORS this month and reports business is good on 20 meters.

Traffic: 6RJ 114, 6IM 60, 6AYC 36, 6CZR 24, 6APA 22, 6ALX 12, 6BER 12, 6AFT 10, 6CTH 9, 6CKC 2, 6ANE 2.

HAWAII—SCM, John A. Lucas, oh6BDL—Most every one seems to be doing DX along with traffic work. The first E-OH QSO was reported by 6AXW who worked ef8YOR on 20 meters. Eb4WW reported hearing them R7. 6BWV worked saCB8 and also made the BPL again this month. 6ACG worked fo8SR and A3X. 6DCU QSOd fo9SR and got an R7. 6CFQ will visit California till mid September. Says his code class at 6BUC is coming along fine and that he'll have them taking tricks shortly. 6BDL worked CR1O, then 2100 miles from Panama bound Brisbane, on 20 and took 9 messages without a stop from start to finish. No break-in and sent single. 6ACG and 6CXY are now ORS.

Traffic: 6BWV 110, 6ACG 86, 6AXW 81, 6CXY 67, 6BUC 37, 6DCU 37, 6BDL 23, 6CFQ 3.

LOS ANGELES—SCM, Don C. Wallace, 6AM—This is the first report submitted to the new SCM, so be at ease. We note with pleasure the high total of 6BJX and guess this is to be expected with the able direction of 6BXA. 6AGG in spite of school QRM does nobly. 6CMQ acts as YL headquarters for 2AMQ in a weekly schedule with 2AMQ's girl. 6ZBJ is arranging champion chess matches over the air. 6AJQ makes the BPL, with 6ALZ, 6AM, 6BXD, 6AGR, all showing substantial totals.

6BUX, the DX hound, QSOd Australia 20 times during the month, working 5 countries on 20. 6AWQ is moving to Lake Arrowhead. He is a new assistant route manager. 6CDY is applying for ORS. 6CQP is changing circuits. 6CZJ, 6PY and 6NW all show their value to the section with good prompt reports. 6AKW continues to QST Aust like local with 39 QSOs there. 6CHT, 6RF are both showing good DX with foreigners. 6DEG has a phone on 180 as well as 42 and 84 meter waves. 6BRO wants to know the QRA of XC55. 6CLK finds 20 much better for DX and rag chewing. 6AIO has a new plug-in transmitting going, and we need more of these. 6DAQ finds 20 much better than 40 but lacking in traffic. 6BHR and 6CGK come through with a report as usual.

6AM worked every continent last week, but has to kiss the set goodbye and go to Chicago, New York and Boston for a month. The office here at Long Beach will take care of the report as usual, and we plan on keeping the LA section on the map as well.

Traffic: 6BJX 288, 6AGG 148, 6CMQ 133, 6ZBJ 122, 6AJQ 101, 6ALZ 76, 6AM 72, 6BXD 50, 6AGR 46, 6BUX 39, 6AWQ 34, 6CDY 28, 6CQP 27, 6CZT 18, 6PY 20, 6NW 20, 6AKW 19, 6CHT 14, 6RF 9, 6DEG 6, 6BRO 6, 6CLK 5, 6AIO 3.

SAN FRANCISCO—SCM, J. W. Patterson, 6VR—6BGB leads the Section this month for traffic. 6BIA has been QRW the YLs and has found little time for brass pounding. 6PW has also been QRW working overtime with the telephone company. 6KW showed up after his vacation all tanned up and itching to pound brass again. 6CAK is installing a WE50 and has visions of R1O reports in Australia. 6CCR has gone back to 40 meters deserting 20 after QSOing ef8YOR. 6VR is still on 20 meters and has installed a 75 watt bottle primarily for this wave. 6DEK will QRP to one 210. He has been handling press for WUX. 6HJ is trying to put S.F. on the map as the champion checker player. He has challenged 6DEG to a game over the air and needs help. 6ADM received a report from England on his sigs and when last seen he was oiling his heap up so things could slide off easier on their journey. 6PN is rebuilding now and will be on soon with a 210 in a TP-TG transmitter.

Traffic: 6BGB 72, 6VR 49, 6DEK 34, 6CCR 32, 6KW 29, 6BIA 26, 6ADM 24, 6PW 24, 6CAK 20, 6HJ 12, 6PN 4.

NEVADA—SCM, C. B. Newcombe, 6UO—6ABM has moved to a new location and is getting out much better. 6GA, using an H tube, has worked Hawaii and aj-1AK. 6CHG had to lay off for a few days on account of the arrival of his first grandchild. He says the kid's QRK is R1O, pure DC. 6UO has a UX852 and getting fine results.

Traffic: 6ABM 56, 6UO 13, 6GA 4, 6CHG 34.

SACRAMENTO VALLEY—SCM, C. F. Mason, 6CBS—The SCM has a new UX852. 6FR reports 20 meters to be the best DX wave. 6CGM is kept off the air by railroading most of the time. 6AVB is using a Hertz antenna. 6CDK still sticks to 40 meters.

Traffic: 6FR 15, 6CGM 22, 6AVB 36, 6CDK 90.

SAN DIEGO—SCM, G. A. Segs, 6BQ—6DAU is leaving to join the Navy. His report is a dandy and we are sorry to lose Frank in the S. D. Section. Best wishes, OM. 6AJM, Route Manager, has moved to

1821 Altura Place, San Diego, and is again on the air. 6HU and 6CTP are still QRW school. 6LH likes 20 meters and has his xmitter there regularly. 6BAM rebuilt now using Colpitts and piles up nice traffic totals. 6AXU is on a vacation for about three weeks. 6BFE is rebuilding both xmitter and receiver. 6SB has been sick but expects to be back on the air soon. 6CNK reports hearing ef-8JF and eb4WW. 6OX wants a couple of skeds. 6SJ has another good traffic total, a result of regular operating and skeds. 6FP is in new quarters, 4030 Goldfinch St., San Diego. 6MB has all night for tfc now. 6ANC says getting hot in Imperial Valley and sigs not very good. 6BXN has a new transmitter going good now.

Traffic: 6DAU 162, 6SJ 74, 6BAM 55, 6AJM 55, 6AXU 43, 6BXN 39, 6FP 19, 6CNK 18, 6CTP 12, 6LH 12, 6ANC 12, 6BQ 5, 6SB 5, 6OX 5, 6MB 3, 6HU 2.

ARIZONA—SCM, D. B. Lamb, 6ANO—6BJF is working on 20 meters. 6DCQ worked phone FB on 20. 6DWS had YL op on air once. 6CDU has been working 6BXU on schedule playing checkers. Hi! 6AZM hasn't been able to do a thing on account of local QRW—QRM. 6ANO works on 20-40 getting out FB. 6DIE is perking good. 6DIB uses 600 V. M.G. 6CUW is active yet so the YLs didn't get him after all. Hi!

Traffic: 6BJF 37, 6CDU 57, 6BWS 20, 6DCQ 11, 6ANO 26.

SANTA CLARA VALLEY—SCM, Frank Quement, 6NX—6CKV acting SCM—The SCM—6NX has gone and done it. He has taken unto himself an OW, and is now happily honeymooning in northern parts. Congrats Ol Timer. 6AMM comes through with high traffic honors and a real report. Made 15 points in relay contest and is still best contact with Philippines. 6BYH is still on job as an OO and reports 17 points in the contest—FB. 6BVY hits the BPL once again and is fighting QRN at the Philippine end of his schedule. Also very active in Naval Reserve work. 6ACQ says things are going fairly well now. 6BCH has a job we don't envy. He has to hit his 250 watter to get it going as the grid is warped and touches the filament. Hi! Hi! 6BMW has been QRW trying to crystal control his quarter k.w. bottle. 6CSX is, as usual, handling traffic with the OH stations. 6DDN has worked OH and is on every Sunday. 6CTE has fallen off in traffic but has one schedule. 6CLP has been QRW but found time to handle a couple. 6CJD is another one that is busy at College. 6CKV is on both 20 and 40. He scored 54 points in the relay contest.

Traffic: 6AMM 349, 6BYH 109, 6BVY 102, 6ACQ 25, 6BCH 20, 6BNW 20, 6CKV 18, 6CSX 11, 6DDN 8, 6CTE 7, 6CLP 2.

PHILIPPINE ISLANDS: SCM, M. I. Felizardo, op-1AU—This report received by radio via op-1AU and nu-6BVY—Due to QRN setting in and making QSO with U. S. A. difficult after 10 P.M. local time traffic has slumped a bit. Op-1HR keeps batting a high average through, the traffic originating from Army folk at Fort McKinley. Op-1DL is off the air most of the time but still has some traffic. Op-1AT QSY'd to 20 and worked am-VS1AB, first P. I. Malay contact on the 20 meter band. FB, OM! Op-1AH is sure lining up for an ORS. Just look at his tfc this month. Op-1AU handled messages for Vienna, Austria QSR'd via el-LAZX. Old aj-1ZQ lately of JKZB visited Manilla enroute to Schenectady, N. Y. via Europe.

Traffic: op1HR 226, op1AU 175, op1AH 150, op1AT 39, op1DL 6.

ROANOKE DIVISION

NORTH CAROLINA—SCM, R. S. Morris, 4JR—Due to the resignation of 4MI, the position of RM is again open. Anyone who desires this job please write 4JR at once. Drop a card in the box on the 26th, OM. You don't have to be an ORS to get credit and every little helps. 4RY has graduated from Davidson and will be on from Montreat during summer vacation. 4DB has been QRW exams. 4OC is getting fair results from his crystal controlled set now. 4NJ is using plug-in coils to work on 20, 40 and 80 meters. 4 PP has at last got his license renewed. 4TS has been handling signal corps traffic with 5DL. 4EC has trouble too—shot tube, lost mast, BCL QRM etc. 4SJ seems to be on fitfully, perhaps he will get his set going steadily soon. 4OH has been QRW YLs. 4FV worked DCZ. 4BX is rebuilding the station arrangement. 4JR lost a game of checkers to 6 ABN on twenty.

Traffic: 4TS 7, 4SJ 4, 4EC 3, 4DB 2, 4JR 1, 4BX 7, 4NJ 4, 4RY 3, 4OH 2, 4FV 1.

VIRGINIA—SCM, J. F. Wohlford, 3CA—3KU, 3JT and 3WM have been trying local phones. 3MU rebuilt xmtr. and filter system. 3WM worked eg5BY, his first foreign contact. 3CEB has skeds with 3NR 7.30 PM daily. Has changed to 40 meters for summer work. 3AHL was in relay contest but only made 15 points. He was QSO NM, EI, EB, OA, OZ, NR, EF, NQ. 3CKK will not have much time for work during the summer. He has joined the Naval Reserves, and will instruct recruits in radio, on the sub-chaser. 3UX blew a fifty watter but is putting in a 250-watter now. 3NM-3DL is very QRW school but has maintained sked with 3NR expects to have five point system after school. 3IE is going to Washington for the summer but will be on in full force in September. 3BGS says nothing extra to report although he handled a few messages. 3KG has done nothing but is on the air some. 3BMN is running a BC station now but we hope he will be back on the air soon. 3RX-3SR is doing some experimental work now, so no traffic handled. 3CA expects to get that long-looked-for and much-talked-of crystal control on the air by middle June. 3BDZ has connected with ex3VO of Richmond in California. 3CKL has been visiting hams this spring and early summer with the track team from VPI so not much work reported at the station.

Traffic: 3CEB 24, 3KU 30, 3BGS 9, 3NM 7, 3UX 33, 3AHL 36.

WEST VIRGINIA—SCM, C. S. Hoffman, Jr., 8BSU—During the last month, there was considerable drop in traffic, due to school exams and general overhauling in transmitters. 8VZ reports being busy at WSAZ. 8WK is adjusting his crystal set. 8DOI is a new ORS. 8BBM is experimenting. 8BJB is putting in Mercury arc. 8AUL, 8QH, 8CEK, 8CDV are 20 meter stations, all doing excellent DX. 8DPO reports good DX with two 210s. 8BSU and 8AWM spent several days in Huntington at 8WK where a hamfest was held by 30 hams. The SCM congratulates Huntington for having such a splendid organization and wishes to thank the hams for their courtesies.

8VZ got in some nice traffic relaying for flood relief work with 9BWJ and 8DVT in Kentucky, handling 48 flood emergency messages in five hours. FB. 8CDV worked a couple of Sc's.

Traffic: 8VZ 48, 8CDV 2, 8BJB 8, 8AUL 6, 8BSU 1.

ROCKY MOUNTAIN DIVISION

COLORADO—SCM, C. R. Stedman, 9CAA—Denver: The ORS of 9DQG and 9BJN have been cancelled. 9DKM has resigned his position as RM of Colorado as he says he is quitting the game. We understand that a certain YL plus several other YLs has brought this on. The OM at 9BDF will soon sign a 7 call. The YL remains in Denver, however, and will be on with a new call, the old one having expired. 9CAA blew himself to a new 75 watter. 9DGJ and 9EAM are still doing their stuff. 9OO came thru with a delayed report this time. 9BQO is going on a 3 months trip thru the midwest and central divisions and expects to see lots of hams. 9CDW is going to join 9CAA in going 9DKM one better. They are going to mix YLs and Radio. 9QL, 9EEA and 9DED report as usual. 9CAW says 9BQO is a "two timer". 9DWZ has a much improved note lately. He is doing good work as official observer.

9BYC has given up hope of ever hearing from the SCM regarding some 5 meter tests. Hi. (Have patience, OM). 9CDE will not be on much this summer. Keep up the reports, OM. You are the only station in the Section who has never missed a report since you got the ORS and the record stands for 4 years back. This is an example of what the SCM wishes all ORS could be. 9DSU has applied for ORS and turns in a good report.

Traffic: 9CAA 91, 9OO 62, 9DSU 28, 9DWZ 27, 9EAM 18, 9EEA 18, 9CDE 17, 9BYC 11, 9QL 11, 9CDW 7, 9CAW 1, 9DGJ 1.

UTAH—WYOMING—SCM, Don C. McRae, 6RM—Traffic took a big drop this month and only about half the usual number of reports were turned in. A great number of the gang were busy with school and in getting ready to go on vacations so that only a few did any brass pounding. 6CLQ still continues the good work this month keeping schedules every A.M.

except Sunday. 6BAJ reports using a 210 with good results since his H tube went west. 7DA has been working on 20 with splendid results but had very little time this month to push many thru. 7RX blew his 50 but is operating with lower power at present. A couple more new stations are being lined up in Wyo. and let's hope to see some more going good before long. The SCM is leaving June 10 for his vacation and hopes to visit some of the gang down in Calif. while he is gone.

Traffic: 6CLQ 91, 7DA 25, 6BAJ 15, 7RX 4.

SOUTHEASTERN DIVISION

FLORIDA—W. F. Grogan, SCM, 4QY—4NE sends in a list of schedules that looks like a R.R. time table. FB, OM. 4VS is working 18 hours a day but handled some traffic in the six hours left, FB. 4DD has been doing good DX on 20. This is the time for 20-meter work while the QRN is bad on 40. 4CK is going all the way to Indiana just to see how his sigs sound. 4HY sez his 50 went west and didnt' even advise him of the trip. 4OB and 2TK are exploring the 20 band and hooking up a 250 tube. Great stuff, boys. 4JZ is still with us. Twelve ORS were cancelled this month so better remember to mail that little card gang, or the rest will be cancelled. 4QY is on 20 for the summer and also going down to 5 meters soon.

Traffic: 4IZ 63, 4NE 62, 4VS 25, 4DD 23, 4CK 23, 4HY 4, 4OB 4, 4JZ 2, 4TK 1, 4QY 13.

ALABAMA—SCM, A. D. Trum, 5AJP—Summer time is with us now for a few months and we cannot expect any too much. Let's do the best we can. You fellows that complain of not getting mentioned in *QST*, try and send in a report and see what happens. The SCM regrets that he hasn't a vivid imagination concerning your activities. Birmingham is thriving with amateur activity again with some new stations. Let's have some reports, gang. 5ADA is planning to buy a motor-generator and do away with the chem-rectifier. 5JY's junior thought he would be a second op and got tangled up in the xmitter and JY cussed the old set so much it felt ashamed and started perking as it never had perked before. 5AJP has been working at 5JY this month. 5ATP has returned from Georgia Tech. where he was chief op at 4AV. John Andrews is looking for his six letter call, having sent in papers for his license this month. 5AFS has dismantled for the summer. 5NL has been on consistently and has a good sig. 5ABS is very sorry for his showing this month but was out of town a good deal which accounts for it. 5JP got his ORS this month and feels like a king with a crown. 5FI wants traffic. He handled some very important two way traffic in record time. 5AX sent his report via 5JY by air. Is still alive with a good DC note. Chris Englehart is on the air with the call 5VX. 5DJ is on with four 201A's with 350 DC. 5AV is going strong. 5DI has returned from Auburn and is on the air again. Bewig is going to have classes this summer for code practice for beginners. Harrison has been sick and his being the backbone of the hams there, it paralyzed the others from reporting.

Traffic: 5ABS 6, 5ADA 24, 5AJP 11, 5FI 19, 5AX 38, 5JP 14, 5NL 44, 5DL 56, 5DF 3, 5AV 11, 5JY 60.

GEORGIA—SOUTH CAROLINA—CUBA—PORTO RICO—ISLE OF PINES—SCM, H. L. Reid, 4KU*—Porto Rico: It seems that the gang on the Island are going to come out if it and show us real stuff. 4KD has written to all the fellows asking their support in putting PR back in the lineup and he's making good headway. 4KT is installing a Mercury arc. 4KD is keeping skeds with HIK, AYRE, 6KO and np4AAG.

Cuba: Mr. L. B. Foster, U. S. Naval reserve station at Guantanamo Bay, Cuba, has written in for the Handbook and is going to try to get the Cubans lined up so we can get their regular monthly report.

South Carolina: 4AAM is on 38 meters at 9:30 am and 12 midnight. 4EI has rebuilt his station and is putting 2.5 amps into the antenna with input of 140 watts. "4EI gets married June 28th, second attempt". Congrats, OM. 4JK has recovered from a double operation and the Sawbones have left his pocket book in such shape that Claude says the old 201s looks good to him now. 4WA is on the air under high pressure as the YLs are giving him QRM. 4KZ has a fifty going (working, of course).

Georgia: 4TU is doing nice work still carrying on skeds with his father at Santiago, Chile. 4KU is doing good work on 20 and likes it FB. 4IO has a new 852 coming and 4RM has a new 204A enroute. 4AAH is on again after a temporary leave and is experimenting with Hertz antennas. 4TU got an R8 report from ek4AUH and took a message from him for a YL in NYC.

Traffic: 4EI 22, 4AAM 12, 4KD 5, 4AAH 4, 4TU 17, 4KZ 1, 4JK 6.

WEST GULF DIVISION

OKLAHOMA—K. M. Ehret, SCM, 5APG—5FJ, RM for Western Oklahoma, sends in his last report from Norman for the summer but will report from Enid for the balance of the vacation. He expects to hold a ham reunion for Northwest Oklahoma in Enid this summer. With 5AMO leaving the University for the oil fields to dress tools, traffic seems to be doomed at Norman for the summer. 5AMO did good work in the International tests with a total of 16 points. 5VH is going back on as soon as he can raise enough money to get a 7½ watter. Hail ruined 5APC's wheat crop and guess he'll have to mortgage the farm to keep up brass pounding. 5ANT is on the job every morning from six to eight. 5FJ has a permit to construct a BC station so traffic will suffer. 5VT is new Op in 5FJ's family. Mebbe grand dad next. Hi! 5AEQ and 5DQ are QRW school exams. 5ANL has rebuilt his 80 meter transmitter and is on the air with a great wallop and getting fine reports. 5APG is still constructing his crystal controlled transmitter. 5SW is working steadily but won't be satisfied until he tries a Zepp antenna. 5AKA is getting out fine with a WE 50 watter. 5AFX is getting back in the game after an absence of several years. 5QL has his big brute safely installed in its new location and is pushing a Zeppelin so successfully that to date he reports QSO 100% with all foreign DX called. 5AAV is suffering a University complex but we hope that a summer's sojourn in Denver will restore his radio pep. 5AJ has a pair of 75-watt jugs amplifying the output of his 15 watt master oscillator.

It appears that traffic will be light in this Section during the summer due to hot weather inertia but after the University hams get settled down at home, we anticipate some activity. Several 200 meter fone sets are in operation in the State but the operators do not seem to be sufficiently interested to report their traffic totals and news. How cum?

Traffic: 5APG 3, 5SW 8, 5AJ 1, 5AKA 9, 5ANL 12, 5AGN 2, 5AMO 135, 5FJ 118.

SOUTHERN TEXAS—SCM, E. A. Sahm, 5YK—Activity seems to be as great as ever although summer is now advancing rapidly. One evidence of summer, however, is that an epidemic of rebuilding has again broken out. 5ABQ is rebuilding his set and for that reason has not handled much traffic. 5RR, a prospective ORS, had handled some. 5HS has handled considerable traffic but says he has been forced to mail six messages. 5EW-5PK, who have recently combined, have handled considerable traffic and maintained schedules with nine different stations. E. W. Wilkins, formerly of Mirando and now of Refugio, says he will see the gang soon with 1KW crystal control. Tennant, our old stand by at Lynchburg, was in the relay contest and handled traffic with nearly every country on the globe. Tell the Houston and Goose Creek hams that visit you, OM, that we need a few good ORS in that neighborhood. Houston should be large enough to have a few. Joe Wright of Mirando reports that he will be back with us next month after an absence for a while. 5ARQ is on the air for the first time using a 201-A.

Traffic: 5EW-5PK 123, 5HS 14, 5RR 2, 5AHP 21, 5ABQ 5.

NORTHERN TEXAS—SCM, W. B. Forrest, 5AJT—With the coming of the summer months the SCM urgently requests that all stations try to be prompt with reports in order that the showing for this section may be as good as possible. 5OK is back on the air again and doing some nice work in traffic handling. 5AJJ has moved to New Orleans. The gang loses a good man and friend, but wish him every success in his new location. 5HY maintains schedules with 5PK and 5KK. 5WW is doing some experimental work, but still manages to get in a traffic report each month. FB, OM. 5AKN handled some nice traffic with KFSK, a ship from Shanghai to New York. 5RG adds his endorsement to the new UX-852 transmitter tubes. He is getting excellent results with his. 5AHU is handling traffic on 40 meters. 5RO is moving to Las Vegas, New Mexico, and will be on there shortly. 5AYD and 5AXQ are new stations in Commanche.

Traffic: 5RG 21, 5AHU 29, 5WW 22, 5HY 16, 5OK 85.

CANADA

MARITIME DIVISION

NEW BRUNSWICK—SCM, T. B. Lacey, 1EI—Activities are a little below par in this Section, owing to good weather conditions and the gang finding the call of the great outdoors too much for them. 1AD again appears to be the leading station for the month having several DX records to his credit. 1AM is working on both 20 and 40, moving traffic with commercial speed. 1AI is on the air occasionally and is getting excellent results with his new power supply. 1AX claims his sigs do not get out of his own back yard, but we have seen several cards that testify they are roaming at large in Europe, both on 20 and 40. 1AQ is busy studying for final exams and is gradually raising both the price and output of his H tube. 1AN is now operating a broadcasting station at Fredericton. 1AK has been busy erecting new antennae and has concluded that third harmonic gives him best results. 1CB is on the air regularly and though only a newcomer, has had several good QSO's with NU first, second, and third districts. 1EI has received several reports from Europe, operating a set owned by Thorne 10-BO.

Traffic: 1AD 15, 1AM 17, 1AI 15, 1AX 80, 1AQ 6, 1AK 31.

PRINCE EDWARD ISLAND—SCM, F. W. Hyndman, 1BZ—1AP has done exceptionally good work for being a new man.

Traffic: 1AP 5.

NOVA SCOTIA—SCM, W. C. Borrett, 1DD—Nova Scotia boasts of two new stations on 40 this month, 1CC of Dartmouth and 1BM of Liverpool. While we have gained two new stations, we regret very much the loss to Ontario of 1CX of Glace Bay, one of the most consistent stations of the Province. 1DD has received a card from fq-PM at Ebolowa, Cameroun, Africa asking for QRA of nc-1CDP. Can anyone supply? Since 1CX has left Cape Breton, will all stations there please report direct to 1DD each month. 1AE of Wolfville suggests Dominion Day Trans-Canada relay. This will probably take place on 40 or 20 meters. Any stations willing to take part please notify 1DD at once.

QUEBEC DIVISION

QUEBEC—SCM, Alex Reid, 2BE—Interest in our great pastime is still holding, even though the boys are planning to depart on their vacations. It was too bad that none of the gang were able to take part in the recent tests. Three stations were forced out on account of moving to new QRA's, and others just did not seem to have the ambition. 2DN and 2AV are the star stations for this month. 2DN has a station in operation at his store, then goes home and pounds brass during the evening. 2EV has his crystal set working and is getting good results. 2HT has a beautiful new transmitter, also a new car. 2AL is doing most of his DX on 20 meters and invites the gang to get down there with him. 2BG had a visit from Capt. Fuller (enough sed). 2BE is getting fine results at his new QRA. 2BM is having antenna troubles. 2BN has been heard (what's the matter, John, did the bug bite again?). 2AX is still experimenting with crystal. 2FO has his set working beautifully on 20 meters. 2EQ is our star fone station.

Traffic: 2DN 19, 2AV 13, 2AL 7, 2BB 9, 2BE 3, 2BV 5, 2AK 8, 2BG9.

ONTARIO DIVISION

ONTARIO—SCM, W. Y. Sloan, 9BJ—Stations throughout the Division have been very active this month with the International Tests. In Toronto, the competition has been keen and the results are being eagerly awaited. Eastern Dist.: 3AEL has been off the air since February but is going to install an 852 this fall on 20 and 40 meters. 3VS has moved to a new QRA and reports the DX much improved. 3AFZ and 3AEL are planning some interesting experiments with two portable sets this summer. 3HE is the latest to appear in the marriage column. Congrats, OM.

Southern Dist.:— 3CS, is, as usual, far in the lead in the activities in this district. 3CB and 3IA took in the convention in Detroit. Two new fellows have made their appearance, 3DD in Woodstock and 3DL in Courtright. A new junior op has arrived at 3UD. We suppose by this time, 3UD has him well grounded in the Q signals.

Central Dist.: 3BT reports things there are rather dead, as most of the stations use 80 meters and the by eg-5HS while using very low power on an experimental 852 and a very small antenna system of the most rudimentary nature. 3AZ has departed for Northern Ontario to operate a short-wave station for the Ontario Forestry Service at Women Lake. 3DY has been doing experimental work at extremely short-wavelengths around one meter and less and also continues to use 42.7 and 21.3 meter waves with excellent results on low power. 3UR is still using a single 202 and uses both 40 and 80 meters. 3CJ is also a station using but a single 202 which gets out with but 500 volts on the plate. 3DW is on the air but failed to report this month. 3BK is active in all else save reporting. 3EL has been in operation occasionally on 41 and 20 meters, handling one very important death message successfully on 20. 3BR is also very QRW at school and radio has had to suffer. 3BL has appeared occasionally on 20 to test an oscillator. 9AL has apparently decided to eschew crystal control that won't control and is now doing excellent DX consistently on 20 meters with an ordinary oscillator. 3FC has also been using 19.8 meters exclusively. 9BJ has not been in operation as Bill is moving to his summer home at Toronto Island and everything had to be dismantled and stowed away. 3DB has been active as usual using a single 202 and working successfully both on 40 and 20 meters. 9BZ has been very active this month on both 20 and 40 meters. 3CC says that the old 202 continues to perk and the same old DX is accomplished. 3JM, a pioneer station from the old spark days, is again on the air using the modern CW this time. 2CO is now in Toronto pounding brass on 40 meters under the call 9CO. 3GG is going strong on 20, piling up DX on low power. 3HP is also on 20 and 40 doing good DX.

Traffic: 9AL 12, 9BZ 22, 3EL 6, 3CC 4, 3CJ 3, 3UR 10, 3DY 5, 3BT 3, 3HP 26, 3FC 20.

VANALTA DIVISION

BRITISH COLUMBIA—SCM, E. S. Brooks, 5BJ—(March-April) The report from Victoria arrived too late to be sent in with the last report so here it is: 5HO, a new station, steps out and works op's and os's. 5CO wants to QSO stns. 5AJ still puts R7 sigs to oz and os with 20 watts input. (April- May) 5AJ reports only 16 QSO's with oz and 22 with os this month. 5CO blew a 5'er and replaced it with a 201A. 5AR's new set is perking FB. 5HO worked a Brazilian. 5CT is too busy fishing to pound brass. 5AM has closed down. 5AV is waiting for a new tube. 5AC reports good DX. 5GF is housecleaning. 5GO has a new sync and is out to break records. 5HB installed a chem. rectifier with fair results. 5AD and 5AU took a trip to Victoria, visited the gang there and returned with a raft of new ideas. Have some cards for nc-5FS—please send your QRA, OM (SCM).

Traffic: Mch-Apr.: 5AJ 92; Apr.-May: 5AJ 94, 5AC 17, 5CO 14, 5AV 1.

ALBERTA—SCM, A. H. Asmussen, 4GT—4DG holds the record for traffic and wish we had more like him. FB—keep it up, OM! 4CL holds the record for DX and is next in line for the WAC, having worked three continents. 4CU is working hard for a WAC and there is a good chance of Alberta having two and maybe three WAC's. Calgary has a live bunch with a number of new hams on the air. The AREA now have a club room and enough junk to put a station on the air. 4IO with the help of some of the new converts will build the club station, while 4AX and 4AG keep up the good Spirits of the club and 4DA and 4GF the code practise for beginners. 4DQ has made some real DX records for which the credit goes to the OW. 4DI is doing good work. 4AH is rebuilding. 4AL is resting on his laurels. 4HM has rebuilt and sure has a neat outfit having at the same time worked his first DX. 4BZ is getting out better every day. 4GT will be off the air for a while moving to Edmonton.

Traffic: 4DQ 4, 4DG 42, 4DI 8, 4CU 6, 4GT 5, 4IO 7.

SASKATCHEWAN—SCM, W. J. Pickering, 4FC—Very few reports this month—apparently due to the spring weather and ORS are liable to be cancelled if they fail to report. Say it with cards. 4AA is busy with a BC station but will be on again soon. 4AC is busy and hasn't much time for brass-pounding. 4CB has gone on his vacation. 4FA is on 20 but reports no traffic and is QRW with farm work. 4FC was QSO oz-3AU for 1½ hours. 4CM is a new station at Humboldt, and is working hard for an ORS as is 4CP. There is very little activity on the Canadian band at present.

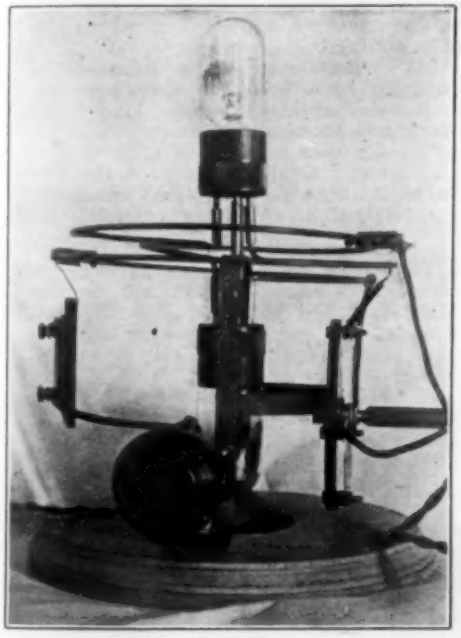
Traffic: 4AC 11, 4FC 2.

Experimenters' Section Report

THE report must be almost completely omitted this month because the time of both of us here at headquarters has been completely occupied by duties which developed very suddenly and unavoidably in connection with the Hudson Division Convention, which is reported elsewhere.

TRANSMITTER TESTING

For this convention and also for *QST*, Mr. Hull devised and constructed a shielded oscillator of simple construction for testing certain things about a transmitter which



THE 5-METER PUSH-PULL OSCILLATING RECEIVER AT ITALIAN 1ER

are ordinarily neglected. The work on this device and the trip to the convention used up all the spare time of the preceding week—plus that ordinarily devoted to this section.

THE ¾-METER BAND IS FORMALLY OPENED

It developed that there was a bare possibility that at the Hudson Convention we might be able to open the ¾-meter band formally and before witnesses as part of a proper League meeting. Mr. Boyd Phelps and the writer had both operated tubes in this neighborhood and Phelps had constructed a variety of very short-wave oscillators as described in the last issue. We therefore seemed the logical candidates and on practically no notice the attempt was made. By working day and night (somewhat to the neglect of *QST*) the apparatus was gotten into shape and a demonstration message transmitted a short distance to the receiver in the meeting room, formally opening "Three Quarters" as an A.R.R.L. transmission wavelength. The details of the story will appear in the next issue of *QST*. The date of the formal opening was Saturday, June 4. The time was about 4 P. M.—unfortunately both of us were too tired to note the exact time.

REGARDING R.F. CHOKES

It seems that this section has at last developed enough material on radio frequency chokes so that we will be able to run an article on the subject in the next issue, wherein there will also be a more complete section report.

GENERAL REPORT AND BARCLAY CHART

Before this magazine arrives, there will reach all members a general letter from Mr. Hull and also a radio calculation chart. The letter will explain itself while the chart is to be regarded as a gift from Mr. R. H. Barclay of 194 Crafts Street, Newtonville, Mass. It is requested that members of the section acknowledge the chart to Mr. Barclay directly. —*R. S. K.*

Strays

1HN tells us that as an acknowledgment of working 6AVJ, he not only received a QSL card but a list of the "International Intermediates" and a photo of that station. This is some different from the usual remarks we get about stations failing to QSLL at all.

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Remember, fellows, that the Hydrographic Office publication No. 205, "Radio Aids to Navigation," is obtainable from the Hydrographic Office, Navy Department, Washington, D. C. The price is only 90 cents and it is well worth while if you are a seagoing op.

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The International Resistance Company will send to anyone interested, copies of their leaflets giving information concerning resistances and their use in radio. They may be addressed at the Perry Bldg., Philadelphia, Penna.

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W. L. Jepson of Beverly Hills, Calif., says it would take a tuner capable of performing like one of these sliding ladders in a shoe store to copy some of the short wave artists who swing in and out like the moon in a cloudy sky.

I.A.R.U. NEWS

BELGIUM

SINCE licenses have been granted, our amateurs have been working very hard and DX communications are taking place quite regularly. The most active stations are 4WW, 4AX, 4CK, 4CB, 4AU, 4AC and 4BC.

"Practically all of our stations interested in intercontinental work are using the so-called Levy aerial. This is a Hertz antenna with a two-wire, current feed. This gave very excellent results at ef-8JN and most of our stations proclaim it to be a decided advantage over all other types they have tried. (This type of antenna was described on page 12 of the July, 1926, *QST*. —Asst. Tech. Ed.)

"4WW has been keeping a daily schedule with the Norwegian whaler, AQE since she left New Zealand waters bound home via the Panama Canal. Good signal reports are obtained and a good deal of traffic is handled.

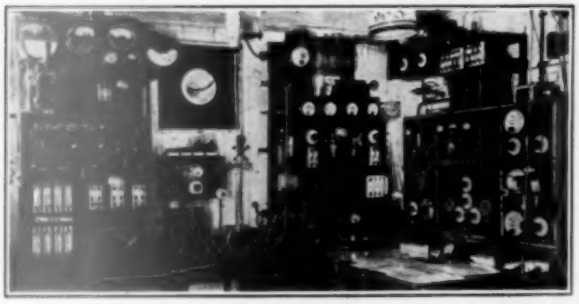
"4ZZ is reported R-9 by afIB in Saigon and works him easily, besides making numerous contacts with other countries outside of Europe.

"4AU keeps schedules on both the 40- and 20-meter bands with Saigon, Chile and Brisbane: contacts being almost certain on all sides.

"ebK5 has been reported R2 in Melbourne. He works on low-power with only 30 volts on the plate of his tube. It would be hard to believe this report except that he has received a QSL card which checks with his log book.

"4UU is putting up a Hertz antenna, Zeppelin type feed for operation on 20-meters during the summer. He will use a maximum power of 20 watts.

"Kindly note that all QSL cards to Belgian amateurs are to be sent to the Reseau Belge, 11 Rue du Congress, Brussells." —*eb4UU, General Manager, Reseau Belge.*



THE OUTFIT AT foA3X, DURBAN, SOUTH AFRICA
From left to right the main panels are power unit 200-watt transmitter, and universal receiver (8 to 23,000 meters). The meter on the table in front of the receiver is a microammeter for measuring received signal strength.

BRITISH GUIANA

There is a low-powered transmitter with call VPA operated by Stanley I. Comach at Mabaruma, North West District, British Guiana. He has been working some of the "nu" stations although his equipment is rather meagre and old.

A receiving tube is used for transmission and the plate supply obtained from a hand generator which (so Comach says) was built for Noah. It has been lying idle for centuries and has only just been resurrected for this job. It has to be wound up rather strenuously to get enough juice for operation with the result that whoever is doing the winding gets muscle-bound in short order. As the station is located about 150 miles from civilization on the British Guiana-Venezuela border, there is no power available for this work.

There is little opportunity of obtaining materials and although a steamer comes from Georgetown each week, they invariably bring the wrong material when any is ordered.

Reception is good and it is hoped that many QSOs will be made.

MEXICO

The Union de Radio Experimentadores Mexicanos, held its elections for officers for the next two years at station CYB, Mexico City. The new officers are: President, Fernando J. Ramirez, nmJH; Secretary, T. Hinojosa; Treasurer, M. Veramendi, nm1C.

The new officers are going to make a very strong effort to get as many new short-wave transmitters on the air in the coming years as possible. They will endeavor to convert and educate the BCLs to this phase of radio. Instruction in code, electricity and radio is given free at the club-house and printed instructions are being distributed all over the country. These instruction sheets may be had for the asking.

The meeting hall, light and other necessities for the club's meetings are supplied by station CYB of the Buen Tono Company which is Mexico's largest cigarette manufacturing factory. All the members of the club are issued beautifully engraved certificates of membership. These are somewhat similar to the A.R.R.L. certificates although the motif is decidedly Aztec. All stations that are members of the U.R.E.M. are authorized by the government to handle traffic. The club also acts as an interference committee to keep the air free from illegal operation, power leaks etcetera.

FRANCE

We have the following report on French activities forwarded to us by Prof J. Reyt, ef8YOR.

"On the 32-meter band, the conditions during January, February and March were very good and distant stations were received well. Static was heard but rarely. Many contacts were established with the New Zealand and Australian stations and daily reception of oz2AC, oz4AC and oz4AE was possible.

"The French boat, Caniopée, FBIO, was worked by 8YOR when between New Zealand and Australia. af8FOK in Hanoi, Indo-China was QSO ef8QRT although the amount of power used was very small.

"The S.S. San Francisco, RXY, when located near Panama was QSO 8JF, this being the first contact between France and Panama. The stations nj2PZ and nrCTO are heard each morning in France and have held communication with 8JF, 8JN, 8YOR and 8QRT. During February, work with the U. S. A. was excellent and in the mornings numerous 5's and 9's and also a few 6's and 7's were worked. Several contacts with Californian stations have been made. 6TK, 6OI, and 6UA having been worked by ef8QRT; 6OI and 6UW by ef8YOR and 6HM by ef8JF. ef8YOR has also been in contact with nu7EK and nu7VH.

"English 32-meter transmitters are heard very well during the day. A new African station fkKTC of Kartown, Sudan was worked by 8IX and 8YOR. The first contact between France and the Belgian Congo was made on the 11th of March when ef8YOR was QSO fc8HSD in Elizabethville. The "fo" stations are heard regularly at night and many QSOs have been made by 8JF, 8CT, 8YOR and 8GM.

"More and more French stations are working on the 20-meter band. The most active ones are 8CT, 8YOR, 8JN, 8BF, 8GM and 8IX. Tests between nu1RD and ef8YOR show that it is possible to communicate during the whole day on this wave. Contact has been established between these two stations at 10.00 G. C. T. and also at various hours in the afternoon. Work in this band at night is also excellent and the "nu," "nc," "sb," "sc," and "sz" stations are heard regularly with good signal strength. ef8CT and ef8YOR have had numerous contacts with stations in all but the fifth, sixth and seventh U. S. districts.

"There has been organized a series of daylight trial transmissions by ef8JN between nu6VZ and 8JN, 8YOR, 8CT and 8GM. The signals of nu6VZ are being heard in France with remarkable regularity and the most favorable hours have been 15.00, 16.00 and 17.00 G. C. T. Signal strengths as great as R6 were had and 8YOR succeeded in making the first daylight contact between France and California."

We have also received the information from R. Audureau, ef8CA, Secretary of the Resau des Emetteurs Francais, that this organization now has a membership of 333. This is certainly a fine showing and the organization is to be congratulated for the excellent work it is doing.

DCZ

Have you heard DCZ? There is an interesting story to be told of her trip from New York to San Francisco.

She is the German peace boat "Vaterland," property of Count Felix Von Luckner who made quite a reputation during the war and who is now on a lecture tour. He is traveling across the continent and the "Vaterland" left New York in early April for her trip through the Canal. The Count was to meet her in San Francisco and she was then to continue on a cruise of some two years duration.

Some of the Second District amateurs decided that she should not leave port without a short-wave set and 2ABT very generously presented her with a 50-watt transmitter and a receiver which were installed and adjusted by 2CUQ.

2CUQ was to keep in contact with her but after she got below Haiti, communication was very unsuccessful. 2APD, 2BZO and 2UO helped 2CUQ immensely by perfectly splendid coöperation. When she reached the Canal, her signals were not readable and 9EKF stepped in to fill the gap.

Next, we find 6HM on the job. He first picked up a CQ from DCZ on April 22nd

when she was starting up the Mexican Coast from Panama. The operator, Fritz Jonske, said that they had had no news for two weeks and could not copy press because of the bad QRM on 600 meters. They had been out of all contact with shore. A schedule was arranged to handle some messages and give them news.

The very next day she had a break-down in the engine room and it was only due to this short wave contact that the operator was able to get off a long cable to Germany ordering the necessary parts needed for repair. It was also possible to notify the Count who was lecturing in Chicago, of these conditions.

She next ran into a big storm from the north and two schedules a day were kept instead of one. The storm drove her off the coast faster than she could make headway north and according to position reports which were being forwarded to San Francisco every day by 6HM, it looked as if she were QRD Honolulu. If it had not been for the excellent work of 2ABT, 2CUQ and the West Coast hams, no reports would have been had of this boat and probably there would have been many ships scouring the Pacific for her.

After the storm let up, the wind was from the wrong quarter and not much use could be had of her sails. (Primarily she is a sailing vessel with auxiliary power.) To make matters worse, the supply of fuel oil ran low and only one engine was being run. The generator was used only at night.

There seems little doubt but that she shall reach port safely having such excellent contact with land. When she does arrive, a big reception is to be given for the Captain and crew but we feel quite sure that the radio operator will be missing, having been kidnapped by the West Coast hams.

JAPAN

The Japanese amateur has not been having a particularly good time although he certainly has been active, in a way.

There were more than 40 enthusiastic amateurs and although they were using very low power most of them were making remarkable records. The average station consisted of one or two 201-A tubes while a few were using 202s. A very few "high power" stations employing 50 watters were in operation. Despite this low power most of the stations were in contact with New Zealand, Australia, South America, China, Philippines and Africa.

On January 25th, it was found that the Government officials were going to construct a portable short-wave transmitter and receiver with which they intended to make contact with the transmitting stations and in that way catch them in the very act of carrying on illegal transmissions.

Immediately upon getting this information, all amateurs were told to QRT and to dismantle their transmitters at once. Due to this action, none were caught by the officials.

On March 7th, the situation became a bit worse as an official rule was made which confined the wavelength of receiving apparatus to be between 430 and 170 meters. It is, therefore, prohibited to listen in on short wave signals.

At the end of March, a conductor of a BCL magazine, deceiving one of the amateurs, obtained a complete list of the QRAs of all the amateurs. Up to the present time the amateurs in the Third District have been visited by Government officials and each has been forced to give a detailed account and explanation of his conduct. Stations in the other divisions have not as yet been so visited.

While it is theoretically possible to get a license for a transmitter, it is practically impossible to obtain one. Although it is expressly stated in the law that such licenses may be obtained, the qualifications necessary are such that one must be at least a professional in order to get one. A movement by the amateurs to make the obtaining of licenses for general transmission possible is under way and looks rather promising at the present time. Perhaps they may, some day, be officially licensed but until that time arrives all QSL cards should be sent "under cover" to prevent the authorities from obtaining information concerning QRAs of these stations.

NEW ZEALAND

nu9ARN has passed us a message from oz4AK to the effect that Mr. Gibbs, Chief Engineer of the New Zealand Telegraph Department will be traveling in America and Europe for the next six months. He will attend the International Radio Conference while in America. He is already keenly interested in amateur radio and intends visiting a number of U. S. amateur stations through which he hopes to keep in contact with New Zealand. The American amateurs are asked to look out for him and any assistance they can give him will be appreciated. The message is signed by oz4AG, who is a junior engineer in the New Zealand Telegraph Department.

PHILIPPINES

We understand that the local broadcast station has succeeded in having a law passed taxing all radio receivers in order to pay for broadcasting. All of the local amateurs are protesting and it is expected that the ship owners will follow suit. 20 per cent. of the tax goes to the Government and the rest goes to the broadcast station, in spite of the fact that they are still ex-

perimenting with the station. Its present modulation is very poor but the fees are being collected just the same.

SALVADOR

ns1FMH has been appointed by the President of the Republic of Salvador as Chief of the Radio Communciations Service. This means that from now on, the amateur will be encouraged rather than discouraged in his short-wave work. Although 1FMH has been the only licensed amateur station, there are two other hams who are getting transmitters rigged up and these will be given temporary permits to operate until the present regulations which were drawn up by men having insufficient knowledge of the subject have been changed so as to allow general amateur work.

Amateur transmission, will be allowed in all the popular short-wave bands now used for this work and there will be no bars on the handling of messages. Up to 500 watts may be used although only c.w. will be permitted. We may expect some action from these folks soon! FB!

ns1FMH tells us that he has heard from Federico Gonzales that he is to put a transmitter on the air in Costa Rica, using the call of nr2FG. The radio population of Central America is growing slowly but steadily.

U. S. S. R.

Carl Madsen, nu9EEO, is on his way to Khabarovsk, in Siberia to install a 20 Kw. transmitter for the Westinghouse Electric and Manufacturing Company. This outfit is crystal controlled and will work on a wave of 30 meters.

He is taking with him a smaller set using a fifty or a two-hundred fifty watter with which he expects to do a considerable amount of ham work. He will use the call of 9EEO or EEO with the intermediate of "as." His wave will always be 30 meters although he will listen in both the 20 and 40-meter bands. He has a schedule to work 2DY who will be on 41.9 meters from 6.00 to 6.30 a. m. and with 9ANZ from 7.00 to 7.30 a. m. This is E.S.T. These tests will be run on all dates of the month which are divisible by five and will run for several months starting in June.

Reports on his signal would be appreciated as they will help considerably in showing just what hours will give best results for these QSOs. Address your cards to Carl Madsen, Westinghouse Radio Engineer, Khabarovsk, Siberia, U. S. S. R. Here's a chance to work Asia for that WAC certificate, OMs.

QSL SECTIONS

QSL cards to amateurs in those foreign countries listed below should be sent directly to the address given. Do not send them to A.R.R.L. Headquarters for forwarding.

Help us and help yourself by sending cards to the proper QSL Section.

Belgium—Reseau Belge, QSL Section, 11 Rue du Congress, Bruxelles.

England—QSL Section, R. S. G. B., 53 Victoria Street, Westminster, London, S.W.1 England.

France—Robert Larcher, 17 Rue Fessart, Boulogne-Billancourt (Seine) France. This is the QSL and QRA Section of the Reseau des Emetteurs Francais.

India—R. J. Drudge-Coates, Cambridge Barracks, Rawalpindi (India).

Ireland—Irish Radio Transmitters Society Solent Villa, Kimmage Road, Terenure Co., Dublin, Ireland.

Italy—Traffic Manager of Radiofonia, Cassella Postale 420, Roma, Italy.

Portugal—Rede Emissors Portugezes, Tenente Eugenio de Avillez, 15 Costa do Castello, Libson, Portugal.

Spain—Association EAR, Mejia Lequerica 4, Madrid, Spain.

It would be appreciated if all other organizations maintaining QSL Sections would drop us a card giving the address of the Section for insertion in this department.

SOME MORE NEW ONES

ac2FF—G. W. Fisk, 303 Victoria Road, Tientsin, China.

acBRJ—12 Kashmir Place, Villa No. 8, Hong Lusk, China.

acZX2—Thibet, China. Complete QRA not known.

ar8LHA—Lambert, Box 86, Beirut, Syria, Asia.

ek4DBA—Fagien, Koenigsberg, Kalthof, Germany. Appeared incorrectly in May.

er5AA—P. Popescu, 143 Carol Davila, Bucarest, Roumania. (Cards under cover.)

enJA— c/o Radio Wereld, 250 NZ Voorburgwal, Amsterdam, Holland.

fm8VX—Alphonse Bautie, Ain-Tedeles, Algeria.

nfBAT—Nassau, Bahama Islands.

nmCYY—Martinez Canton Hnos, Merida, Yucatan, Mexico.

oc8XZ—Radio Centre de Noumea, New Caledonia.

vGLQ—Boat believed off Tierra del Fuago. Any more dope?

xef8FMB—French steamer in harbor of Beiru, Syria.

xen1NL—Dutch steamer "Kinderdyk" QSL c/o Royal Mail Steam Packet Co., Glasgow, Scotland.

These lists are possible only because those who run across new QRAs send them in to us. We want to thank every one of you for your contributions. Any additions or corrections will be appreciated.

Correspondence

Help

49 Harvard Street,
Whitman, Mass.

Editor, *QST:*

I've got to get this load off my chest right away or bust. I've been musing over it for some time and have arrived at the stage where I must spill it.

Some time ago, I answered a CQ from 4— and after the preliminaries he asked me to QRS and QSZ as he was new at the game. I did as he requested and about three minutes later, the family called me to supper. So, necessarily, I had to cut the QSO short. I explained to him that I must go eat and would QSU later. The lad took it that I did not care to work him simply because he was a new man and could not copy as fast as I. We have straightened it all out now and he knows that I told him the truth. He told me that I was the fifty-second station who had been QSO him and that I was the fiftieth to quit him because he was a new man. Fellows, that doesn't sound very good, does it? That episode started me to wondering and I made it a point to listen for and work some new men. After numerous QSO's, I came to the conclusion that there were a bunch of fellows, who, seemingly, will *not* help the new man at all. I don't think they really mean to refuse help to the new man but rather that they have completely forgotten that they would have welcomed a little themselves at one time.

4— said that all but two of the fifty two he was QSO cut him short with 73 and CUL, as soon as they found him to be a new man. I think most of us know that to be only too true, not only as regards 4— but as a general practice among some of the gang. *It isn't right*, gang. We were all new at one time. We all had to start in slowly, so why not do all we can to help the new ham?

We are not all so balmy about foreign DX that we forget our own country entirely. How are the ever increasing ranks of BCLs who are becoming short-wave fans, going to get a start without the coöperation of the gang? If we are lax and don't give our help to the new men, what impression of the amateur radio fraternal spirit are they going to get? It's reasonable to suppose that it won't be very complimentary. The ultimate result will not be good to contemplate if we don't snap out of it. Why, one lad who started in after getting his license three months ago, confided to me that he was just about discouraged and about to give it all up. He could rarely get a QSO that lasted more than five minutes at the most. Fellows, that's what will happen with a lot of them if there is not more coöperative spirit shown.

There have been a few communications regarding this subject but they seem to come from new men entirely. Why should they have cause to write in and tell us about the help they don't get? I think that there is a lot of us who are alive to the fact that there *are* so many new men coming into the game.

So, think it over, gang, and remember that you all had to start once yourself. Don't wait until you are asked to help, *offer* it.

—*T. S. Brown, 1BFX*
ex1JV and ex1CN.

(Ed's note—This seems to be the case with all stations and does not come about because 4— is a newcomer. This "QRU, 73" briefness is more noticeable on 40 meters.)

Saving Calls

2168-77th Street,
Brooklyn, N. Y.

Editor, *QST:*

In the past issue of *QST*, I find the Correspondence Column containing many letters pertaining to QSOs with stations. However, little has been said about the preliminary calling of a station which has just CQed. It is taken for granted that the calls should be as short as possible. A long call is unnecessary and makes for needless QRM and waste of time.

QST has suggested the "three and three" call. This call, many stations find, is not long enough to enable them to QSO. In consequence, we find stations calling for minutes at a time. With the large number of stations on any one band that we now have, it is impossible for an operator to tune thru an entire band in the space that it takes to send a "three and three" call. *QST* states that a CQing station should tune around the band for five minutes after an answer. Yet, why should the station tune for five minutes when the operator knows

that those calling him only call for less than a minute?

Surely, there must be some way by which we can at the same time give a short call and be sure that the other station has had time enough to come to our part of the band. At 2ARM we use the following system that has worked perfectly. We all know that the operator tuning around after a CQ starts from one end of the band and goes right thru. If our wave is in the middle of the band, it will take him quite some time until he reaches our wave. Therefore, why start to call him immediately? If it takes him one minute to reach our wave, why not start to call him about fifty seconds after he has signed off? This would save about one whole minute of calling.

The question now is, "How do I know how long to wait before I start to call? Suppose he should pass over my wave before I begin?" There are several ways to find the proper interval. Upon testing out the following ones, the resulting time was found to be almost exactly the same. If you have "break-in", the thing is very simple. Just begin to call immediately after the CQing station has signed off, meanwhile keeping your eye on your watch. When the station being called breaks, notice how long it took him to get to your wave. Do this several times and average the resulting figures. You will be surprised at how much time you can cut off your calls and still have them do the trick.

If you haven't "break-in", the procedure is somewhat different Send out a CQ yourself. Let us assume that your wave may be picked up at 48 on your receiver dial. After your CQ, find out how much time it takes you to tune to 48 while looking for an answer. Try this several times and average these figures also. You can allow ten seconds difference; i.e. begin calling about ten seconds before the time it takes to come to your wavelength.

Using this system, we have found the "three and three" call is more than long enough. We also find that the percentage of stations who do not come back presumably because they passed over us before we started calling is very small.

This system is only a suggestion. It is a practical one. Give it a try and lessen the QRM.

—*Maurice Apstein, 2ARM.*

Kind Words

La Cotte,
La Moye, Jersey,
Channel Islands.

Editor, *QST:*

Just two words of appreciation.

I have read the "Radio Amateur's Handbook" carefully and am going to re-read and digest it. Speaking personally, it is one of the best radio handbooks I have ever come across, especially from a ham point of view.

I wonder how many hams have had new interest put into radio by the article in the April *QST* on "How Far Is It?" A couple of days illness which kept me off the key were passed most pleasantly thanks to this article and a book of "Trig Tables." It, incidently, opened my eyes as regards the distances in "fact" rather than in "fancy" of some of my QSOs.

In *QST* for April, eg6YQ and eg5MQ's letter on "Cut 'Em Down" is sound sense.

—*A. M. Houston Fergus, eg2ZC*

QRP

59 Marlborough Park, North Belfast,
Northern Ireland

Editor, *QST:*

Although I hesitate as a QRP man, to put my views forward in your columns, I do want to support the pleas of eg6YQ and eg5MQ in your April number and to add a few extra remarks on my account. These remarks do not solely apply to "nu" stations and I hope other stations will consider them.

Many "nu" stations and others give a "CQ Europe" call and after listening for about thirty seconds give another CQ call. It is obvious that they only wish to work high-power stations and do not carefully sift the foreign band. I find that to go carefully thru the 40-meter "nu" band, takes at least six minutes and I think the offending stations might search a little more carefully.

Please remember, the majority of our stations are limited to ten watts input and only a very few are on 32 meters. I know of several DX stations that only listen for British stations on 32 meters and thus, after a CQ call, leave many of us calling them uselessly on 45 meters. Please indicate the band you expect to receive a reply in e.g. "CQ Europe nu 9ZZZ—QRX 32 ar."

There is no doubt that our QRP signals often get thru to "nu" stations with fair strength. This was obvious in the recent QRP tests when no QRO stations in Britain were transmitting and I was able to work four "nu" stations and one "nc" station in an all-night sitting with five watts input, receiving average reports of R-4. On ordinary nights, one gets the impression that DX stations will not reply to a rather weak signal but call and call again till they get a QSA reply.

At the same time, I wish to thank those stations who have carefully sifted the 45-meter band and given many of us QRP stations the pleasure of a QSO; I wish there were more of you!

More power to your excellent journal—it's great!

—*T. P. Allen, Owner eg6YW,*
Operator eg2BX.

ORS Bulletins

1554 Marion Street
Denver, Colorado

Editor, *QST:*

Just a line to tell you how much I like the ORS Bulletin that arrives here every so often. It certainly contains a good bit of news, ideas and advice.

More of the fellows should seek the ORS appointments, not only because they would receive the Bulletins but they would feel more responsibility in the handling of traffic and they would also get better acquainted with Headquarters and their fellow hams.

When you next need QSL cards, why not visit your local Chamber of Commerce or Traveler's Bureau and see if you can't get them to print your cards for you if you allow them to place an advertisement of the city on it.

—*Willard Wright, 9BQO*

The Thrill of First Contact

(Editor's Note: The ordinary run of amateur work has been phenomenal for so long that nothing is phenomenal any more, if you know what we mean. So many contacts have been made between opposite ends of the earth that we are very likely to think that every possible contact has been made. But contact betwen Australasia and South Africa has been singularly difficult, it appears. The Australians succeeded in doing it some time early last year but only after a schedule had been kept for several months, and it will be a surprise to many amateurs to learn that the QSO between New Zealand and South Africa was not made until a few months ago. The following letters from Miss Brenda Bell, the YL at Zedder 4AA and sister of the illustrious Frank Bell, tell the story of one of the biggest thrills that can come to a radio amateur.)

———

Palmerston South, N. Z.
March 14, 1927.

Editor, *QST:*

".....We still continue to fail with South Africa, though there have been several reports of hearing them in the last few weeks, mostly around four to six in the morning. Crept out in stockinged feet myself before the dawn to-day and was rewarded with what sounded like a perfectly good Yank until it occurred to me that it was late for Yanks. Awakening still further I copied "foA5Z" and sat up. It might be someone calling him—I'd heard a similar noise on that mark before—but perhaps..... He began again: "CQ DX foA5Z", and signed "Macgregor, Caledon, S. Africa", which is OK in the callbook, so .....anway I let fly. Battery down; pushed in an extra cell. N.D. Again.... A faint noise....Was it? And then the washing-machine motor started up! Out across the wet yard in the rain and shoeless, cut off the motor while a maid gasped, back again, but no..... Anyway I have spent six dollars on a cable and we propose to camp on Mr. Macgregor's wave from now on. Dawn is 5:20 and I heard A5Z first at 6:12 N.Z.T. He was then R2 but at 6:15 he was R3-4 and up to 6:30 was a steady readable R4.

We are going to Dunedin to help swell the crowd and cheer the Duke and Duchess of York this week, but I'd rather catch that African. I trust I shan't disgrace myself and murmur "73 OM CUL" if I'm presented. Here's hoping.

Brenda Bell.

———

Palmerston South, N. Z.,
March 16, 1927.

Editor, *QST:*

Hurray, we've done it! Yesterday I rose with the dawn once more and sat in still excitement, but N.D. Then appeared ac8EM, an old friend in Shanghai who was kind enough to say he would listen. Back he came and said "No sign of A5Z. Can't be on, as conditions good here and would certainly hear him. If you are trying again tomorrow will listen again and let you know. What time is sked?"

"0630 GMT", says I. "What?" says he. "0630 GMT", says I. WHAT?.....0630 GMT.....Lord, I've been and cabled that when it ought to be 1830. What a fool!

Could have wept with rage but hied me to the telegraph and spent another 15/6 confessing my sins in six words: "Meant eighteen thirty".

Meant to arise at four this morning to make sure, sked being six N.Z. Time, but forgot to turn on the alarm, having thoughtfully put it "silent" yesterday when I beat it. Awoke at five and out. Rain, pitch dark. No sigs except commercials. Called CQ Africa at intervals, and at six, A5Z. N.D. Again. What do I hear a bit below A5Z's wave?? "4AA ozfo A5Z". Damn this static! "RRR OK". Wow! Too excited to copy and R1-R2 and static frightful. Still I'm sure he said RR OK. Call again. Hurray, it's all right. "Hi.... Gracie, ring up Mr. Frank at once and ask him to come down and speak to a gentleman in South Africa". But Gracie slept on. Finally I rushed to the telephone and did it myself. He certainly arrived double-quick! Mr. Macgregor of A5Z asked if we were excited. We were! It was a vile morning and very hard to copy thru static, so it looks a bit patchy, but parts of it were excellent.

And now I must go and dress for the Duke! Thank heaven television is not yet or Mr. Macgregor would have died of shock.

Somehow I never look my best in my early morning sked outfit. Both stations suffered from QSS but he would be R4 on a decent day. Anyway, cheers loud and prolonged, and we are delighted to have done it on low power. Borrowed a 50-watter for the sked and it arrived smashed, so an aged, aged Gamage did the trick.

Yours, Brenda Bell.

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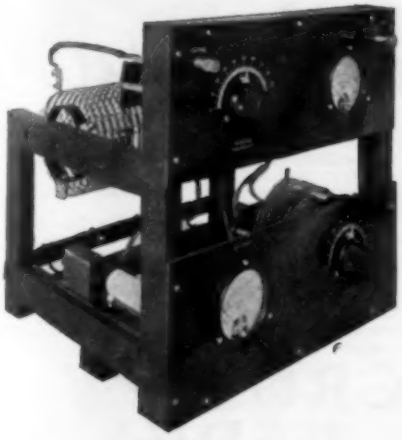

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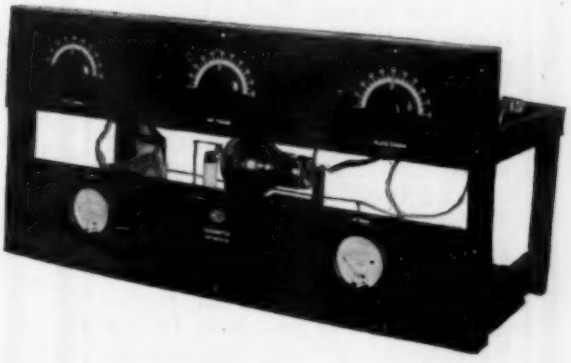
TR-250	UV204A	96.



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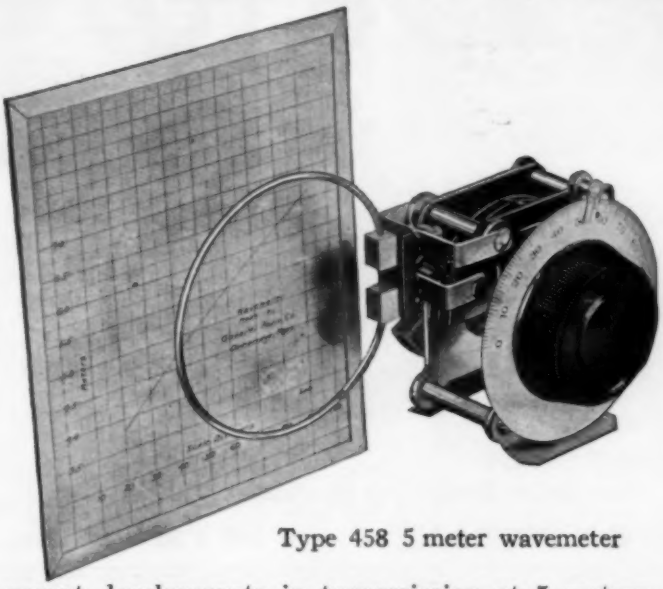

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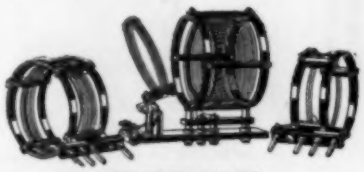

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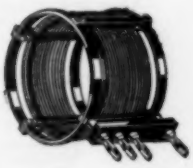

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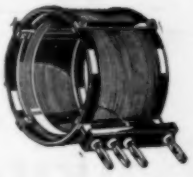

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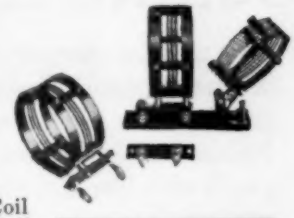

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To Our Readers Who Are Not A. R. R. L. Members

Wouldn't you like to become a member of the American Radio Relay League? We need you in this big organization of radio amateurs, the only amateur association that does things. From your reading of *QST* you have gained a knowledge of the nature of the League and what it does, and you have read its purposes as set forth on page 6 of every issue. We would like to have you become a full-fledged member and add your strength to ours in the things we are undertaking for Amateur Radio, and incidentally you will have the membership edition of *QST* delivered at your door each month. A convenient application form is printed below—clip it out and mail it today.

.....1927

American Radio Relay League,
Hartford, Conn., U. S. A.

Being genuinely interested in Amateur Radio, I hereby apply for membership in the American Radio Relay League, and enclose $2.50 ($3 in foreign countries) in payment of one year's dues. This entitles me to receive *QST* for the same period. Please begin my subscription with the ..... issue. Mail my Certificate of Membership and send *QST* to the following name and address.

.....

.....

Station call, if any .....

Grade Operator's license, if any .....

Radio Clubs of which a member .....

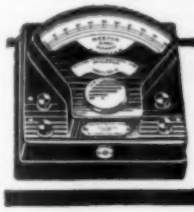
Do you know a friend who is also interested in Amateur Radio, whose name you might give us so we may send him a sample copy of *QST*?.....

..... Thanks!

RESISTANCE
1000 Ohms per Volt

WESTON Model 489 Battery Eliminator Voltmeter is made in double range combinations of 200/8 and 250/50 volts; the latter range can be supplied with an external multiplier to increase it to 500 volts. Handsomely enclosed in Bakelite, supplied with a pair of 30-inch flexible cables.

Weston Electrical Instrument Corporation
158 Weston Avenue Newark, N. J.

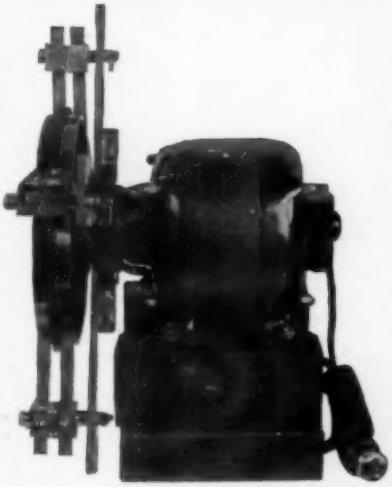


STANDARD THE WORLD OVER
WESTON
Pioneers since 1888

THE SUPER SYNC
The Synchronous Rectifier That Can Be Filtered

The Super Sync is the only synchronous rectifier that can be filtered with ordinary type of filter and deliver a pure direct current.

The construction of the commutator enables this rectifier to rectify practically the full wave thus making the R.A.C. delivered much easier to filter. It is impossible for the voltage to jump between the conducting segments as the insulating ridge between them prevents break-down at this point.



The brushes on this rectifier are made of copper leaf and make a clean sliding contact. There are no air gaps in the commutator to cause the brushes to vibrate and make poor contact.

The synchronous motor can be supplied for either 110 or 220 Volts 50 or 60 Cy. Other name plate ratings can also be supplied but will require a slight delay in shipment.

PAT. PENDING
PRICE $75.00 F.O.B. ST. LOUIS, MO.

MARLO ELECTRIC CO., 5241 Botanical Ave., St. Louis, Mo., U.S.A.

HAM-ADS
NOTICE

This department of *QST* is conducted as a service to members of the American Radio Relay League. Advertisements can be accepted only under the following conditions.

(1) "Ham Ad" advertising will be accepted only from members of the American Radio Relay League.
(2) The signature of the advertisement must be the name of the individual member or his officially assigned call.
(3) Only one advertisement from an individual can be accepted for any issue of **QST**, and the advertisement must not exceed 100 words.
(4) Advertising shall be of a nature of interest to radio amateurs or experimenters in their pursuance of the art.
(5) No display of any character will be accepted, nor can any typographical arrangement, such as all or part capital letters, be used which would tend to make one advertisement stand out from the others.
(6) The "Ham Ad" rate is 7c per word. Remittance for full amount must accompany copy.
(7) Closing date: the 25th of second month preceding publication date.

THE life blood of your set—plate power. Powerful, permanent, infinitely superior to dry cells, lead-acid, Bs, B eliminators. Trouble-free, rugged, abuse proof, that's an Edison Steel-Alkaline Storage, B-Battery. Upset electrically welded pure nickel connectors insure absolute quiet. Lithium-Potassium solution (that's no lye). Complete, knock-down kits, parts, chargers. Glass tubes, shock-proof jars, peppy elements, pure nickel, anything you need. No. 12 solid copper enameled permanently perfect aerial wire $1.00, 100 ft. Silicon steel laminations for that transformer 15c lb. Details, full price list. Frank Murphy, Radio 8ML, 4837 Rockwood Rd., Cleveland, Ohio.

TO licensed hams only—$12.50 Aero Kit $8.13. Ferranti $12 audios $7.80. $25 Browning-Drake kits $16.25. $85.10 Loftin White kits $51.06. $10.00 Ensco Cone 36" kits $7.00. $32.50 modern compact B eliminators with Raytheon $19.50. Latest original packages. Discounts on Cardwell type E, Karas, Hammarlund, AmerTran, Aero, Jewell, Thordarson, Benjamin, Samson, Perryman, Ward Leonard 35%. On Sangamo, Lynch, Daven, Marco, Bodine, Yaxley, Pacent, Ceco 40%. All prepaid. Our weekly data sheets give more dope than all radio magazines together. 20 weeks trial $1.00. 52 weeks $2.50. Over two pounds data, circuits, catalog, prepaid 25c. Fred Luther Kline, Kent, Ohio.

PURE aluminum and lead rectifier elements holes drilled brass screws and nuts, pair 1/16", 1"x4" 13c, 1"x6" 15c, 1¼"x6" 17c, 1½"x6" 19c. Sheet aluminum 1/16" $1.00, lead $1.00 square foot all prepaid. Silicon transformer steel cut to order .014" 10 lb. 25c, 5 lb. 30c, less than 5 lb. 35c per lb., .022" thick 5c less per lb. Postage extra. Edgewise wound copper ribbon, 7 sizes, see Jan. *QST*. ¼" square copper wire better than copper tubing 50c lb. postage extra. Air pocket insulators blue glazed porcelain 8" leakage path fine for transmitting, 4 for $1.00 prepaid. Geo. Schuls, Calumet, Michigan.

"POWER transformers—for 7.5 watters, Filament, 7.5V., Plate, 600V., center-tapped, $5.75. For fifties, Filament, 15V., Plate, 1100V., center-tapped, $8.00. Milliameters, 0-100, $2.00. Rectifier Elements, Aluminum, Lead, pair, 1"x4", 7c; 1"x6", 10c. Wavemeters, calibrated, 15-170 Meters, Complete, $4.00. QSL cards, $1 per 100, highest quality, free samples. Orders filled immediately. Terms, C. O. D. or cash. Complete Radio Catalogue upon request. William Green, 207 Cathedral Parkway, NYC."

WANTED: Used 203s or 203A. Elmer Gunther, Ft. Dodge, Iowa.

2CUZ has for sale: Eleven Cunningham, six Magnatron brand new UX201As $1.25. Bradley transmitting leak $2.50. Brand new VT1, $2.00. Two W.E. fifties $15.00 each. Everything guaranteed perfect.

EDISON element storage "B" battery power units will deliver a pure "B" current of low internal resistance. Superior to dry "Bs" or eliminators. Highest quality, lowest price. 90 volt unit $10.95. 135 volt $15.00. Complete with battery, charger, cord, plug, etc. Rechargeable hundreds of times and guaranteed. Headquarters for Edison elements, parts and supplies. Also special batteries. Send for list. J. Zied, 904 N. 5th Street, Philadelphia, Penn.

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700 WATT transformers 1000-1500 each side $14.00. 250 watt transformers 550-700 each side $10.00. 200 watt filament transformers for fifty watters mid tapped $12.00. 40 watt mid tapped filament transformers for 7½ watters $7.00 C.O.D. or cash. 9CES. F. Greben, 1927 S. Peoria St., Chicago, Ill.

PYREX 7¼ inch amateur transmission insulators, Pyrex stand-off insulators, also radio parts. Write for best prices. F. I. Ellert, 693 Mission Street, San Francisco.

SAVE your hands! Pure aluminum and lead elements, complete, holes drilled, screws, nuts, pair 1/16", 1"x4" 12c, 1¼"x6" 17c. Square foot $1.00. Ammonium phosphate "beats borax", 50c lb. prepaid. J. J. Jacobsen, 400 West 150 St., New York City, 2AHE.

DODGE Radio Shortkut fixes signals in mind to stick. Kills hesitation. Cultivates speed. Produces results. 7AAD Nelms "Did not expect Shortkut to teach code as if by magic but has—almost. Four hours study increased speed from four to twelve per. Very surprising my previous experience considered". Quarter coupon and reports progress made by 200 users (all licensed) 25 cents. Specimen reports each district on request. Shortkut with Appendix and Better Key Work $3.50 U. S. and Canada. Elsewhere $4.00 reg. mail. None C.O.D. Send money order. Check may delay. C. K. Dodge, Mamaroneck, N. Y.

WILL pay five bucks for one burned out 204. Write 4AA.

WANTED ½ kw fully mounted Packard transformer. In writing advise name plate specifications or give dimensions. 6BBH.

CROCKER-WHEELER 450 watt 24/150 volt dynamotors $45.00. ½ KW 500 cycle transformers $12.50. Motor generators 500 cycle half to five KW Crocker-Wheeler; Complete gasoline engine driven power units 500 cycle and dc outputs. Complete Navy transmitters any capacity. Navy portable transmitters complete with power unit. Sangamo Watthour meters designed for battery use $10.00. Govt. wavemeters, leather case, current squared meter, interchangeable coils 125-2500 meters $45.00. SE 1012 receivers range 50-1000 meters used $35.00. Navy Blinker Keys heavy silver contacts $2.00. Henry Kienzle, 501 East 84th Street, New York.

FOR SALE—Advance Sync, S tube, fifty watter, radiation ammeter and Acme plate transformer, 250 watts. Wilfred Hardman, 116 Lincoln St., Lowell, Mass.

FOR sale: 1 Acme plate transformer with 1500-1100-750 and 550 volt taps. In perfect condition. Price $20.00. Bruce Quackenbush, 3 Park Place, Herkimer, N. Y. 8BLI.

WANTED—Kellogg or Western Electric broadcasting microphones. State price and condition in first letter. E. L. Benton, 1627 State St., LaCrosse, Wisconsin. 9ZY.

SHACK furniture. Rigid transmitter es receiver table 30x60 birch top and legs mahogany stained aprons priced at $16.50. Cash with order. Anything in furniture for the home or shack om at prices that can not be beat. Will you give us a trial? W. Ryder, Jr., Hibbing, Minn. 9CIY.

FOR Sale: Acme 500 plate transformer $16.00. R.C.A. UL1008-OT $6.00. Acme 1½, H-500 mil choke, $3.00. Complete factory built REL short-wave receiver $12.00, complete 50 watt transmitter with REL OT (2) power and 211A tube, panel mounted with 3 meters $65.00. Everything for the "ham". Send for list. Wm. H. Brunt, 44 Whittier St., Rahway, N. J.

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400 V. 100 W. Esco coupled to 220 V. 3 ph. A C motor $25.00. 1000 V. 300 Watt Esco motor 110 V. single phase $95.00. 2000 V. 1000 Watt Westinghouse double commutator $275.00. 2500 V. 2 kilowatt Generator double commutator, coupled to three phase 220 V. 1750 Speed motor. 2500 Volt 600 W. double commutator generator coupled to 110-220 V. 60 cycle single phase motor 1750 speed. Also many others. 1mfd Western Electric condensers 50c. New ¼ H. P. 110 Volt 3500 speed Robbins & Myers alternating current motors $8.50. Prices f.o.b. Chicago. James J. Smat, 1734 Grand Av., Chicago, Ill.

METERS: Three 0-2½, two 0-3 Roller Smith hot wire ammeters, new, $4.00 postpaid. 5AD.

HAMS: Get our samples and prices on printed Call Cards made to order as you want them. 9APY, Hinds, 19 S. Wells St., Chicago, Ill.

THE Ensall Radio Laboratory six tube short wave receiver. Range 15 to 210 meters. Inductances, list at $18.50 with circuit drawing. Operates on loop or outside antenna. Parts list on request. We also are distributors of practically all types of radio apparatus. We also build transmitters, receivers, wavemeters, inductances, etc. Prices on application. We employ your parts in any apparatus desired. Blue prints and drawings furnished for any type of radio station, amateur, broadcast, or commercial. Special apparatus constructed to order. Quotations on application. Thos. Ensall (8BDN), 1208 Grandview Ave., Warren, Ohio.

BRADLEY amplifier cost $15 going cheap, $10.50. 8CVW.

NEW 1kw transformers, continuous rating, shell type, Silicon steel core, suitable voltage for large or small power tubes. Bakelite terminal board. Primary 110 volts—50-60 cycle secondary volts. 4400-3300-2200-1650-1100—all voltages have center tap. Exciting current 13 watts—110 v 50 cycles, weight 40 lbs. Price $19.00 F.O.B. Los Angeles., Carl Schwenden, 7427 Alameda Blvd.

QSL cards—two color—government post cards $1.90 per 100. White cards $1.00. Real ham stationary at $1.40 per 100 sheets and envelopes. Postage 10c. Free samples. 8DTY, 257 Parker Ave., Buffalo, N. Y.

TRANSMITTING chokes 30H-125MA, $5.75. 30H-85MA for Raytheon $2.75. 30H-60MA $2.25. 20H-25MA $1.00. General Radio 174-B wavemeter $25.00. 3"x4" .93 watt loss Silicon core 1" thick .014 $1.50. 420-6-110 volt transformer, with midtaps $4.00. 1/30 H.P. Universal motors $2.50. Write for list of meters, transformers, condensers, etc. M. Leitch, Park Drive, West Orange, N. J.

WANTED new 204A and sync. W. B. Michael, Caldwell, Ohio.

FOR sale—complete fifty watt station with tube, meters and everything. S tubes and perfect filter. Shortwave receiver with one step. Strictly high grade equipment and only silghtly used. Sacrificing this splendid outfit for $100. Also Western Electric amplifier $25. Write 9DSK, Fred V. Hines, Owensboro, Ky.

DYNAMOTOR wanted 2000 volt, have Esco 32-359 for sale. 8DOA.

FILAMENT transformers 8 volt center tapped (unmounted) $3.50. One plate transformer 525 volt center tapped $4.75 (unmounted), one Jewell 54 D.C. ammeter 0-1 amp. $5.00. All postpaid. Clarence Barnett, Corinth, Miss.

AERO short wave kits, complete three tubes, nothing else to buy, $40.75. Aero short wave coil kit, $9.50. Marco Browning & Drake kits, $45.50 Prepaid. Quality parts only. Write for description. Lowell Mast, 615 S. Clinton St., South Bend, Indiana.

"S" tubes, omnigraphs, vibroplexes, teleplexes, transmitters, receivers, 50 watters, chokes, meters, transformers, motor generators, all wave receivers. Bought, sold, exchanged. L. J. Ryan, 9CNS, Hannibal, Mo.

WANTED:—"S" tubes, Griffith, 1109 Eighth Avenue, Fort Worth.

HEADQUARTERS for Hams:—Immediate deliveries on Mueller 150-watt input tubes $15.00. RCA 5-watters $3.15. Tobe 2000-volt 5-mfd condensers $13.75. Aerovox —1-mfd 1500-volt tested condensers $1.75. 15-dial Omnigraphs $25.00. "Ham-List" 4c. Romanyel Curtis, 1109 Eighth Avenue, Fort Worth, Texas.

CURTIS-Griffith 250-watt power-filament transformers 350-550 each side $12.50. Thordarson power-filament transformers for 7.5-watters $6.90. Thordarson power transformers 350-550 each side $11.00; 1000-1500 each side $16.00. Edgewound Inductance 6-inch turn 12c; 4-inch turn 10c; 3-inch turns 7c. Aluminum square foot 85c; lead square foot 85c. Curtis-Griffith 30-henry 150-milliampere chokes $12.00. "Ham-List" 4c. James Radio Curtis, 5-A-Q-C, 1109 Eighth Avenue, Fort Worth, Texas.

500 CYCLE ½ kw self-excited generators $65, with gas engine $100. ½ kw motor-generators 120 volts dc drive new with spare armature $60. 1 to 5 kw motor-generators. 500 cycle transformers. ½ kw 500 cycle generator with propeller for airplane radio $40. 275 volt new dc generators $8. 6 volt dynamotors 400 volts at 200 watts output $15. 200 watt 500 and 900 cycle generators $10. 900 cycle dynamotor output 120 volt input 16 volts dc $15. R. Wood, 46-20, 102 St., Corona, N. Y.

SUPER-sync rectifier. Almost new. $48. F.O.B. Tacoma. H. J. Holt, 806 S. Sheridan Ave., Tacoma, Washington.

POSTPAID and guaranteed brand new R.E.L. Transmitting Inductances, double unit with glass coupling rods and clips, $8.90. Single, $4.85. R.E.L. mountings for "H" tubes, $1.89. R.E.L. 50 watt sockets, $1.89. R.E.L. Radio Frequency chokes $1.00. R.E.L. Short Wave Coil Kits, $3.75. Allen-Bradley "Radiostats", the big Primary rheostat, $6.29. Allen-Bradley "Radioleaks", 2000-30,000 ohm variable transmitting gridleaks, $4.89. General Radio Wavemeters, Type 358, $19.25. 3BMS, G. F. Hall, 535 West Hortter St., Philadelphia, Pa.

GREBE CR-18, full set of coils, used one month, $75.00 takes it. 6ox, P. H. Adams, 1682 Torrey Road, La Jolla, California.

NEW power amplifier transformers, 200 watt, 1000 vol secondary with center tap, 2-7½ volt filament windings. Price, without case, $9.50. Other transformers and chokes at equally low prices. Radio 1NZ, 26 Sterling Road, Waltham, Mass.

EVERYTHING for the ham: We carry a full stock of parts for the amateur. Ham radio is our business. Everything in stock for the short wave transmitter and receiver. Jewell meters, Acme chokes and transformers, Thordarson transformers, Aero, Allen-Bradley, General Radio, Ward-Leonard, etc. No. 12 solid copper enameled wire 1c ft. No. 10, 1¼c ft. Send for our catalogue, "Dynex for Dx", E. J. Nicholson, 1407 First North St., Syracuse, N. Y.

RESOLVE now to make that needed improvement in your station. If you haven't it, by all means get 9ALD's free Hamalog, the original and best ham catalog, pick out the things you want, and we'll ship them quick. See our ad elsewhere for some wonderful new inductances, also listing DeForest tubes. New Citiens Amateur Call Books, $.75, A.R.R.L. Handbooks $1.00, both postpaid; Sangamo filter condensers, 1000 volts, 1mfd. $1.95, 2 mfd. $2.50, 4 mfd. $4.00; REL products, No. 125 wavemeter $22.00, No. 127 Inductances $11.00, No. 130 Short Wave Kit $36.00; Special, some General Radio Wavemeters only $7.50. E. F. Johnson, 9ALD, Waseca, Minnesota.

9DPL selling out. Over $200 worth of stuff for $75.00. Complete 20-40-80 transmitter, ham receiver, dynamotor 380 AH-battery, extra tubes, meters, other stuff, Gross 10 watt frame type transmitter, all A-1 stuff and cheap. Will sell all or part. Write for list with descriptions. Howard O. Severeid, Huxley, Iowa.

NEW line of transformers and chokes for eliminator and transmission purposes. 200 watt power transformers at special price. 2APJ, 643-5 West 171st Street, New York City.

0-1500 WESTON voltmeter panel mounting $18. 8UX cartoon drawn to order for your DX cards, $1. Don Hoffman, 50 South Balch St., Akron, Ohio.

R13—1000 cycle, All American audio transformers. The ideal 1000 cycle transformer. Limited number available specially priced postpaid anywhere in the U. S. at $1.87 each. Brand new stock fully guaranteed by All-American. Replace your present transformers and make that DX QSA. Curve sent on request. 9DEM, 1942 N. Lowell Ave., Chicago, Illinois.

Q R A SECTION

50c straight with copy in following address form only:

1AUN—Gordon Wiley, 48 Pearl Street, Gardner, Mass.

1BBT—Raymond E. Lewis, 9 Carter St., Newburyport, Massachusetts.

1BJE—Philip F. Taylor, Care Western Union Tel. Company, Nantucket, Mass.

1KH—George W. Bailey, Webster Road, Weston, Mass.

1LC—Herman Sanborn, Beacon St., Shrewsbury, Mass.

1LX—Randolph B. Reed, 398 Westford St., Lowell, Mass.

2DBJ—Walter H. Werth, 417 W. 150th St., New York City.

2XAI-WAQ Westinghouse Electric & Mfg. Company Radio Test Station, Newark, N. J.

3AG—Willard F. Hunton, Falls Church, Virginia.

3KP 4828 N. W. 16th St., Washington, D. C.

4DP—49 West 4th St., Atlanta, Ga.

4ES—455 N. E. 28th St., Miami, Fla.

4JW—Mark R. Bowling, Jr., Box 145, Louisville, Ga.

5MN—Horace E. Biddy, 1330 Rigsby Ave., San Antonio, Texas.

5RR—Vir N. James, 105 Carolina St., San Antonio, Texas.

6DIA—Archie W. Karvonen, Box 96, Fort Bragg, California.

6DIG—Joe A. Bowers, Box 37, El Centro, California.

6DJA—C. E. Saunders, 392 View St., Mountain View, Calif.

6IP—H. Y. Ballou, 143½ Loma Drive, Los Angeles, Calif.

6SM—A. E. Ekdale, 159 S. El Molino Ave., Pasadena, Calif.

8AYU—Walter V. Turner, 3 Bell Ave., RFD 1, Glens Falls, N. Y.

8CSR—W. F. Kisner, Watson, West Virginia.

8DEI—Geo. M. Benas, 1801 Genesee St., Utica, N. Y.

8HW—Rob-Roy Phillips, 412 Post Court, N. W., Canton, Ohio.

8IN—M. Malmer, 754 N. Walnut St., Youngstown, Ohio.

9ANQ—Albert Herrmann, Jr., 653 Mill Court, Waukegan, Ill.

9BAV—W. L. McNamara, Y.M.C.A. Building, Grand Island, Nebraska.

9CTT—F. A. Nichols, R.R. 4, Pana, Ill.

9DZJ—H. A. Wakely, 779 Main St., Oshkosh, Wisconsin.

eb4YZ—Andre Courtois, Hodimont-Verviers, Belgium.

oa5WH—W. H. Barber, 50 Somerset Ave., Cumberland, South Australia.

oa5BY—Doug. R. Whitburn, Box 920 G.P.O., Adelaide, South Australia.

The following stations belong to members of the A.R.R.L. Headquarters gang. Mail for them should be addressed care A.R.R.L., Hartford, Conn. When operating 1MK they use personal sines as indicated.

1MK Headquarters
1AL H. P. Westman "ws"
1BAO R. S. Kruse "lq"
1BDI F. E Handy "fh"
1BHW K. B. Warner "kb"
1BUD A. L. Budlong "bud"
1ES A. A. Hebert "ah"
1GO L. A. Jones "lj"
1KP - NRRC F. Cheyney Beekley "beek"
1OA R. S. Kruse "lq"
1SZ C. C. Rodimon "cr"

FOR YOUR CONVENIENCE QST'S INDEX OF ADVERTISERS IN THIS ISSUE

Cardwell

THE OAK TREE OR THE MUSHROOM

AN Oak Tree is a noble example of nature's handiwork, defying the decaying forces of the elements for hundreds of years.

A Mushroom springs into being over night and reaches maturity in a few days, fading into decay equally soon.

Cardwell Condensers are long lived, like the Oak Tree. The first Cardwell Condensers are still doing duty, and will continue—useful long after the other parts have been consigned to the junk pile.

Don't use mushroom parts—they may be shinier or cheaper—but Cardwell Condensers will work better and last longer.

Cardwell Taper Plate Receiving Condensers take up less space, have less losses and hold their calibration. The 167-E, illustrated at the right, has a maximum capacity of .00014 and is particularly good for short wave reception.

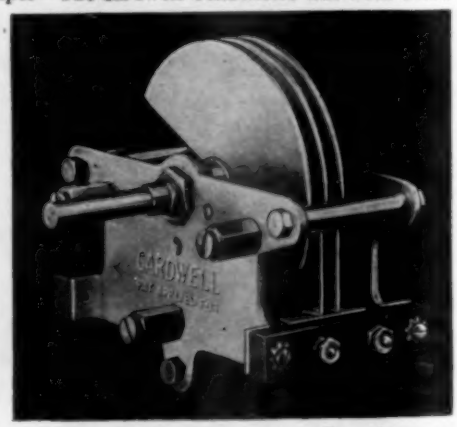
Cardwell Transmitting Condensers are built with a rating for each Xmitting tube and voltage—send for a table that shows which to use. Prices are lower, and two new Xmitting Condensers, with heavier plates and wider spacing improve the line.

"We have a very limited number of reprints of the 2QA Transmitter booklet. Send 25c for your copy."

TRANSMITTING CONDENSERS

Type	Price	Capacity (Mmfds.)	Airgap (Inches)	Spacing between adjacent rotor plates	Plate Thickness	Length (Back of panel)
141-B	$4.25	245	.030	.085	.025	2.375
123-B	5.00	480	.030	.085	.025	2.875
137-B	6.00	954	.030	.085	.025	4.000
164-B	7.00	217	.070	.165	.025	4.000
147-B	10.00	440	.070	.165	.025	5.875
157-B	12.00	217*	.070	.165	.025	5.875
T-199	10.00	330	.084	.208	.040	6.500
T-183	10.00	110	.171	.382	.040	6.500
166-B	70.00	297	.219	.502	.064	10.250

*—Double stator, capacity of each section.



Taper Plate Receiving Condensers

Type	Capacity Mmfds	Price
191E	75	$3.75
167E	140	4.00
168E	220	4.25
169E	340	4.75
192E	500	5.00

The Allen D. Cardwell Mfg. Corporation

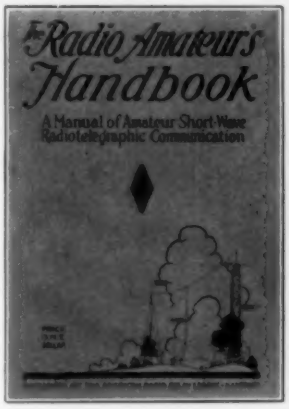
81 Prospect Street **Brooklyn, N. Y.**

Condensers

"THE STANDARD OF COMPARISON"

SPECIAL OFFER!

QST and The Radio Amateur's Handbook



THE RADIO AMATEUR'S HANDBOOK meets and fills the long-felt need. It is at once a manual of approved procedure for the most advanced of "old-timers", a text book on station construction and operation for the average amateur, and the finest introduction to amateur radio for the beginning amateur that has ever been published anywhere. It paints the whole picture of the greatest of modern hobbies, covering everything from so elementary a start as the explanation of what amateur radio is and how to become an amateur, up to the details of construction and operation of the most up-to-date type of amateur transmitter, and the most elusive and complex of traffic-handling procedures. Communications Department questionnaires have shown that the amateur has little idea of how his apparatus works. The Handbook explains it, in "theory" made understandable. Data and complete constructional information on the building of many pieces of apparatus are given.

DURING JULY and AUGUST

Special offer on the Handbook, a year's subscription to QST and membership in the A. R. R. L.

All for $3.00

Even if you are already a member of the League and a subscriber to QST, you may take advantage of this offer. Simply mention that fact and instead of entering it as a new subscription we will extend your present subscription for another year.

American Radio Relay League, Inc.

1711 Park Street, Hartford, Conn.

When you buy BURGESS *batteries*

you buy more than just batteries. You buy a guarantee—a record of satisfactory service as old as radio and attested by users in every part of the world.

We don't ask you to take our word for this. Go into the Ham Shacks!—ask the "amateur" what batteries he uses and see how often the answer is—

BURGESS RADIO BATTERIES